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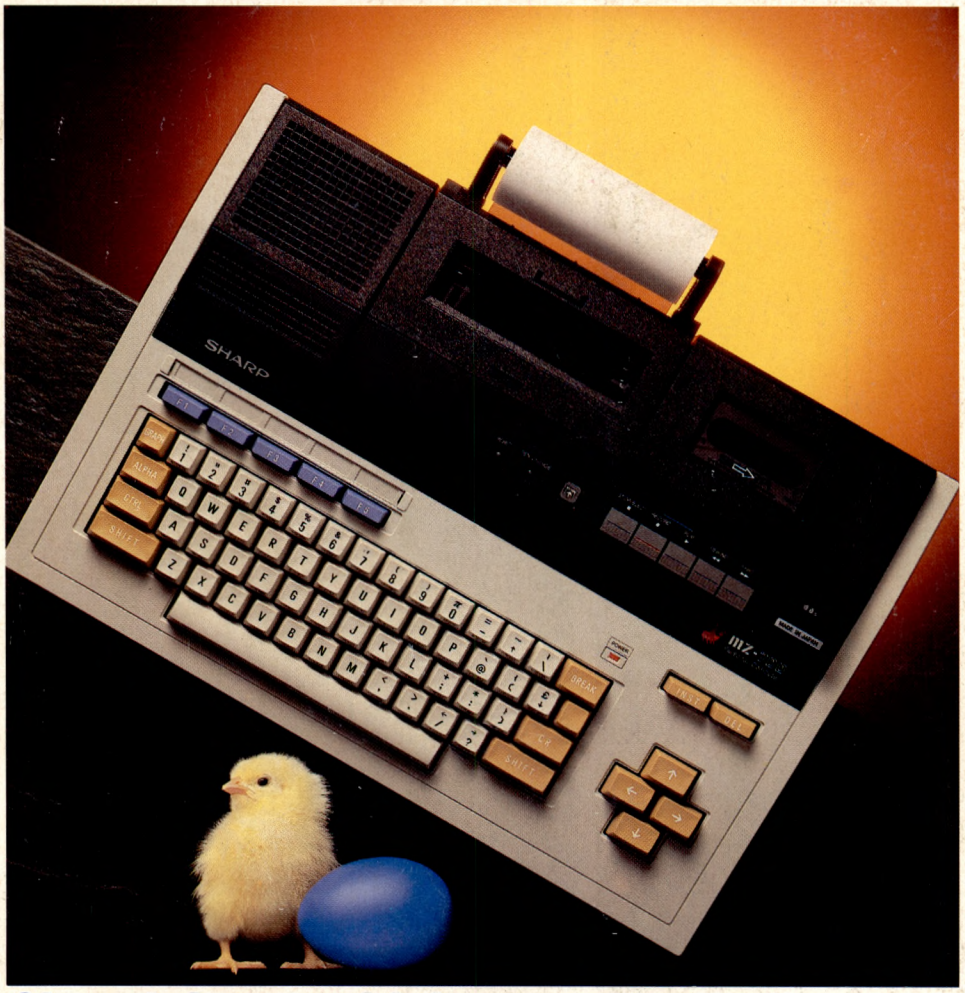
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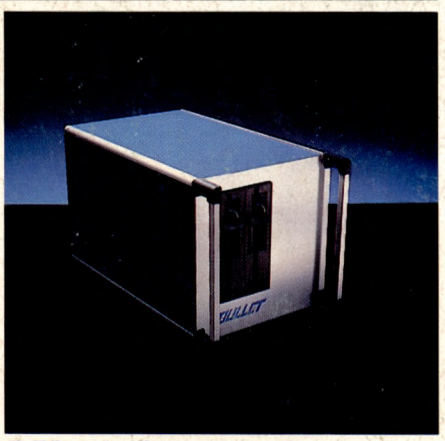
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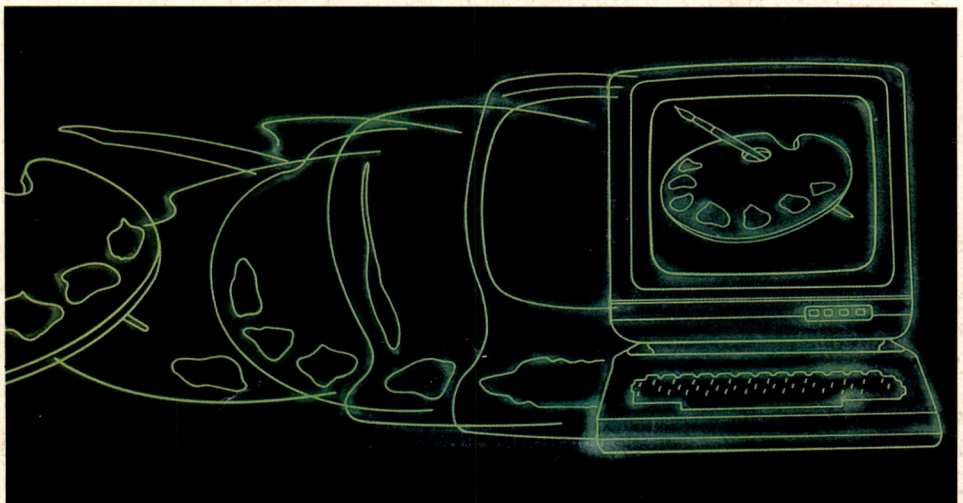
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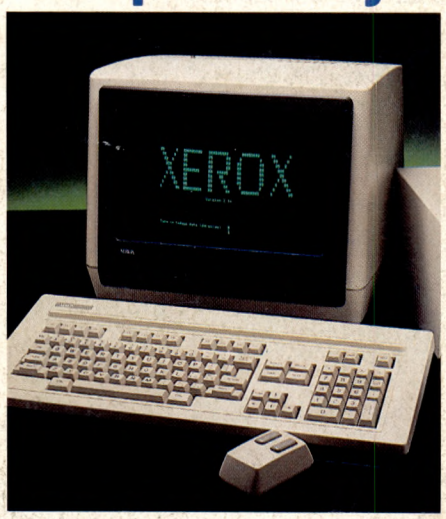
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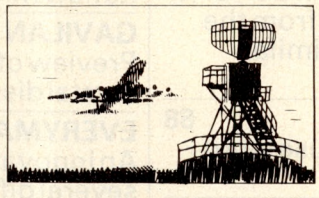
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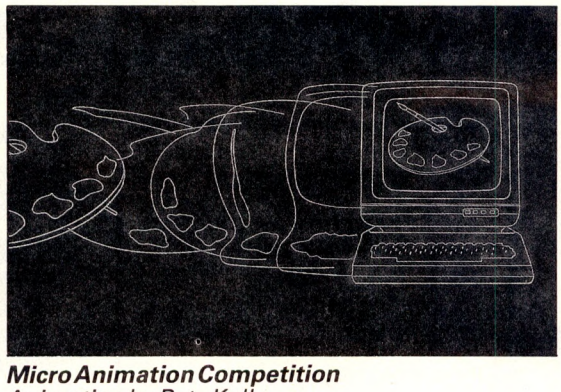
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Micro Animation Competition
Animation by Pete Kelly
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Xerox 16/8
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A machine with two processors that can perform tasks simultaneously.

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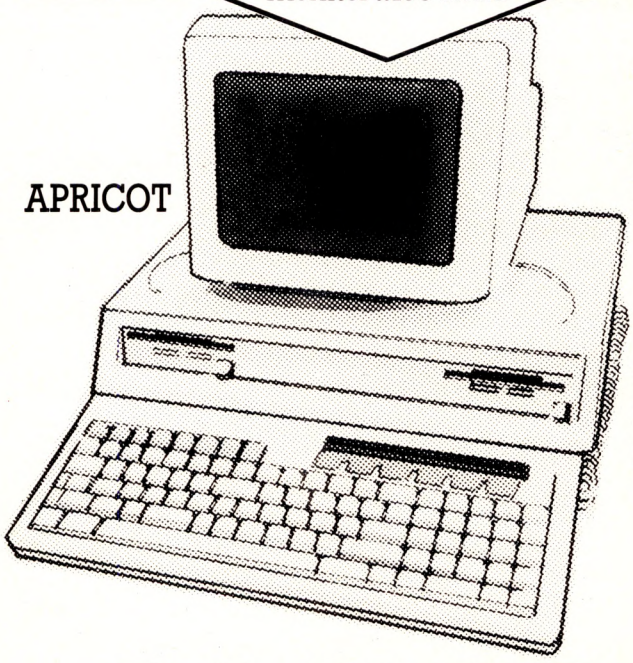
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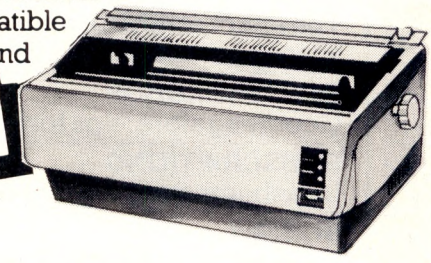
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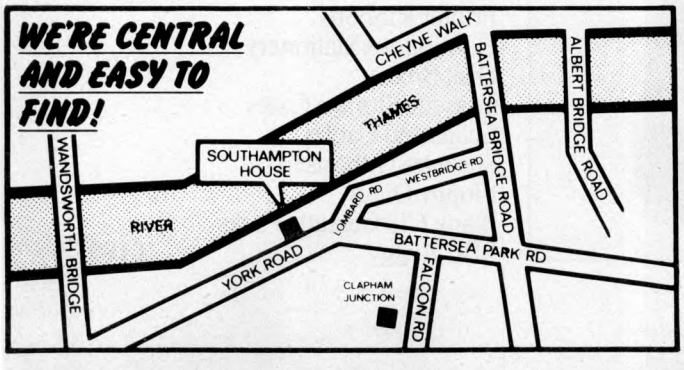
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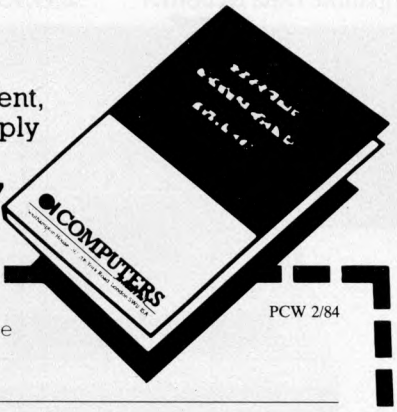
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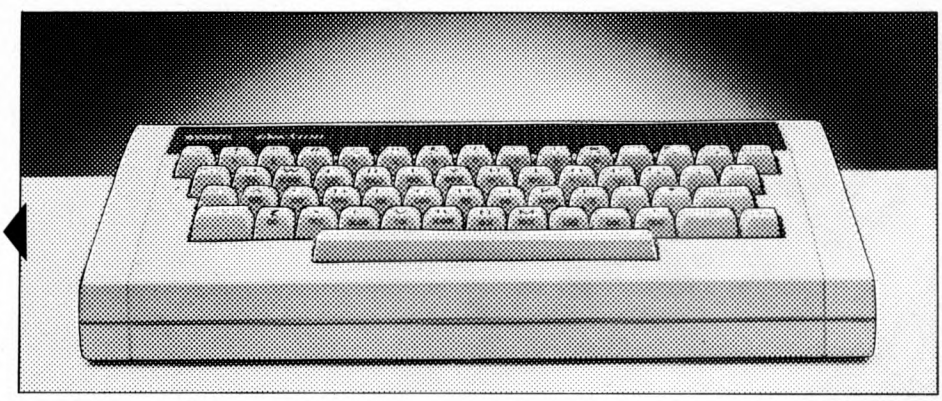
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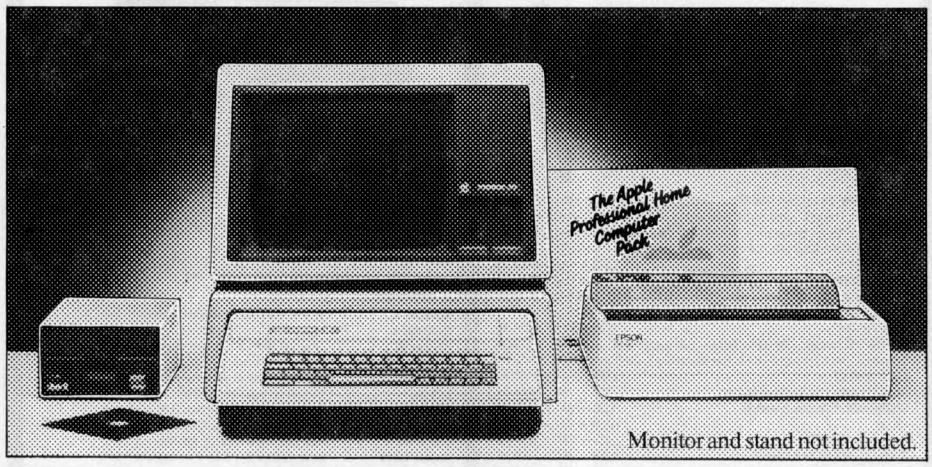
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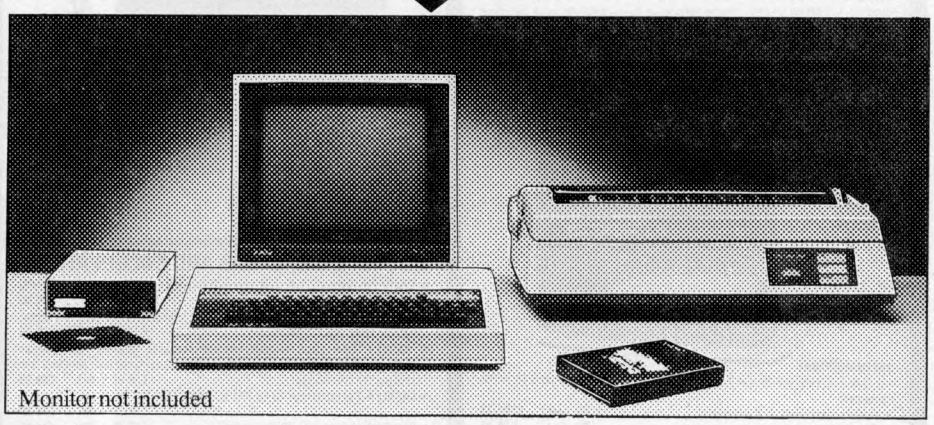
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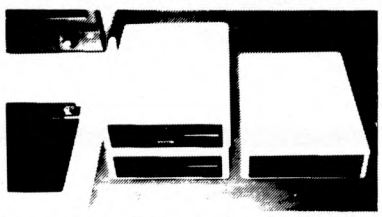
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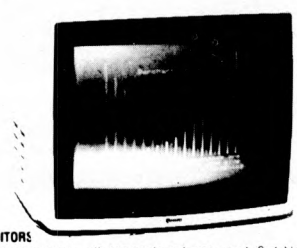
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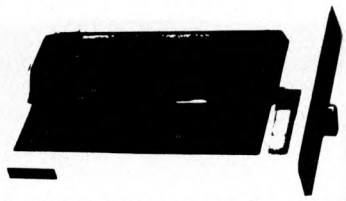
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✻ SANYO SCM 14" Normal res. 14", 400 dots, RGB input supplied with RGB lead	£199 + VAT =	**£228.85**
✻ SANYO SCM 14M Medium res. 14", 600 dots, RGB input supplied with RGB lead	£299 + VAT =	**£343.85**
✻ SANYO SCM 14H High res. 14", 800 dots, RGB input supplied with RGB lead	£399 + VAT =	**£458.85**

EPSON FOR RELIABILITY



EPSON FX80: 80 column, 160 CPS, normal, italic and elite characters, 256 user definable characters, superscript, subscript, 11 x 9 matrix, bi-directional logic seeking, hi-res bit image printing (960 x 8 dots line), friction and pinfeed, 9 international character sets, Centronic parallel interface

FX80 PRICE £349 + VAT = **£401.35**

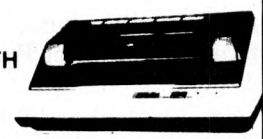
EPSON RX80: 80 column, 100 CPS, normal, italic and elite characters, 11 international character sets, hi-res bit image printing, bi-directional logic seeking, 4" to 10" adjustable pin feed, Centronic parallel interface

RX80 PRICE £239 + VAT = **£274.84**

MX-100 136 column, 100 CPS, friction and tractor feed, up to 15" adjustable carriage, hi-res bit image printing, true descenders, Centronic parallel interface

MX-100 PRICE	£399 + VAT =	**£458.85**
RS232 Interface for all above printers	£55 + VAT =	**£63.25**
EPSON RX80FT (friction & tractor)	£269 + VAT =	**£309.35**
FX100	£479 + VAT =	**£550.85**
Roll holder for FX80	£12 + VAT =	**£13.80**
Ribbon for MX80, FX80, RX80	£8 + VAT =	**£9.20**
Ribbon for MX100	£12 + VAT =	**£13.80**

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GP-100A 80 column, 50 CPS, dot addressable hi-res graphics, 10" wide, fully adjustable, tractor feed, 7 x 5 print matrix, Centronic parallel interface

GP-100A 50CPS PRICE £175 + VAT = **£201.25**

GP-250X 80 column, 50 CPS, 10" wide, fully adjustable, tractor feed, true descenders, 64 user definable characters, double height and or double width printing, 8 x 5 print matrix, Centronic parallel and RS232 (serial) interfaces both included

GP-250X PRICE £219 + VAT = **£251.85**

NEW GP-700A 7 COLOUR PRINTER

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STAR DP510 10" carriage 80 columns

SPECIAL PRICE £239 + VAT = **£274.85**

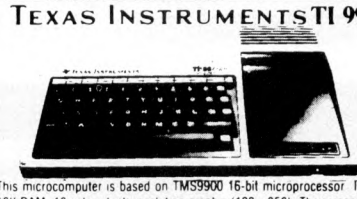
STAR DP515 15" carriage 136 columns

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RS232 INTERFACE FOR ABOVE	£50 + VAT =	**£57.50**

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✻ **CASIO FX-700P**, Basic language, scientific functions, 1568 program steps, Qwerty keyboard, 12 char display	£43.44 + VAT =	**£49.95**
✻ **CASIO FX802P** Basic language computer, scientific functions, 1568 program steps, built-in mini printer, Qwerty keyboard, rechargeable batteries and charger, 12 char display	£78.22 + VAT =	**£89.95**
✻ **CASIO FA-3** Cassette adaptor for PB100, PB300, FX700	£17.35 + VAT =	**£19.95**
✻ **CASIO FP-12** Printer for BB100 and FX700	£39.09 + VAT =	**£44.95**
✻ **SHARP PC-1211** Basic language computer, scientific functions, 1424 program steps, 24 char display, Qwerty keyboard	£60.83 + VAT =	**£69.95**
✻ **SHARP PC-1251** Basic language computer, 4K RAM, 24K system ROM, 24 char display, Qwerty keyboard, user defined key, numeric pad	£69.52 + VAT =	**£79.95**
✻ **SHARP CE-125** Cassette recorder and mini printer for use with PC-1251, incl batt charger	£86.91 + VAT =	**£99.95**
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Matrix Printer GP250X	80 column matrix printer with RS232 and Centronic parallel interface	£273.95
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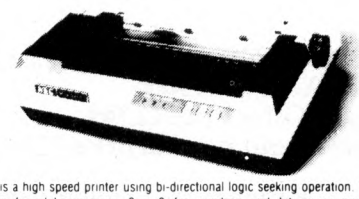
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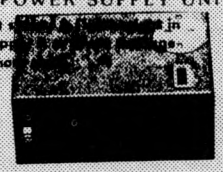
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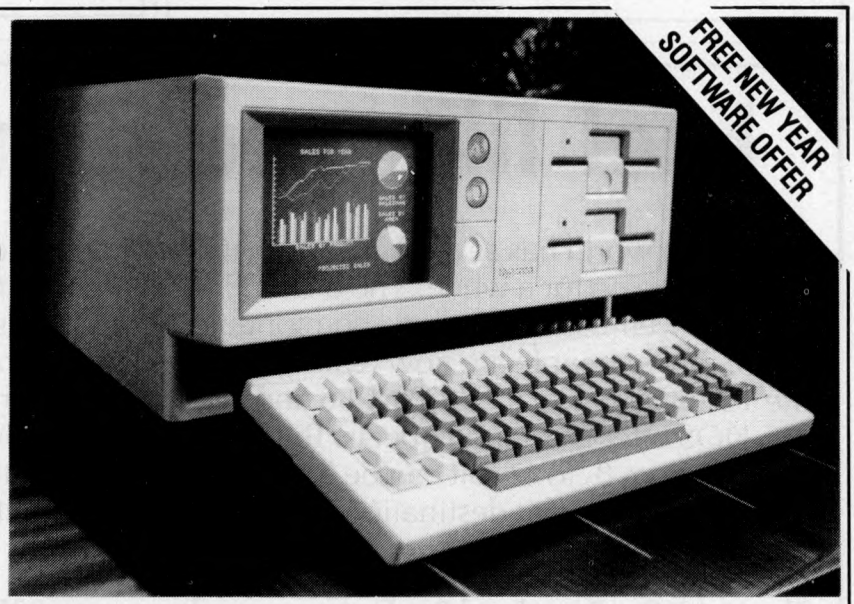
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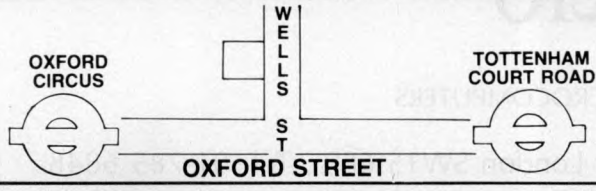
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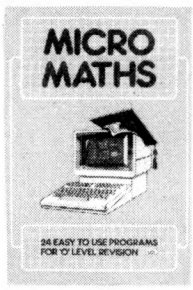
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LS30	18
LS32	18
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LS42	32
LS47	38
LS48	40
LS63	55
LS72	20
LS73	22
LS74	22
LS75	32
LS85	55
LS86	28
LS90	30
LS91	55
LS92	35
LS93	35
LS136	24
LS138	38
LS139	38
LS138	30
LS139	34
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LS151	40
LS153	45
LS156	36
LS157	35
LS158	30
LS175	40
LS240	60
LS241	60
LS242	68
LS243	68
LS244	120
LS245	120
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LS364	140
LS373	60
LS374	60
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4027	20
4034	140
4039	280
4040	40
4051	45
4052	60
4053	50
4066	24
4068	18
4069	13
4070	18
4071	20
4072	18
4073	20
4075	18
4076	18
4077	18
4078	18
4081	18
4082	18
4093	20
4097	275
4099	75
4160	35
4161	99
4162	99
4163	99
4174	99
4175	105
4411	000
4412	790
4419	350
4450	350
4451	350
4490	350
4500	375
4504	75
4505	185
4508	130
4511	46
4512	45
4519	30
4526	60
4528	50
4532	50
4549	375
4568	175
4583	90
4584	40
4585	70
4597	330
4598	290
4599	290
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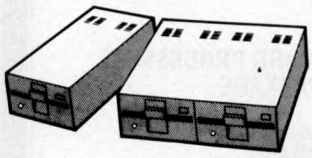
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2.0MHz	225	10.7MHz	150
2.457M	200	10.24MHz	200
3.276MHz	160	12.0MHz	175
3.2768M	150	12.528M	300
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2 x 32 way	295p	340p	240p	300p
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3 x 32 way	360p	385p	260p	395p

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2x28 way	210p	
2x30 way	245p	
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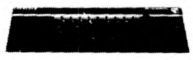
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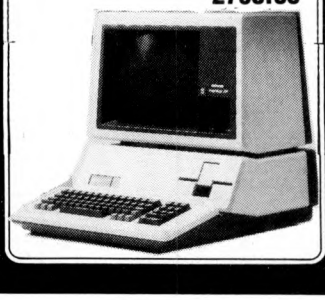
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N·E·W·S·P·R·I·N·T

Guy Kewney reports on the most recent micro innovations at Comdex in Las Vegas, the fate of the ITV micro and Sinclair's new machine



Live from Las Vegas . . .

Comdex has become the biggest computer show in the world. It started out five years ago as a place for people who build small systems to meet people who would like to sell them. It is still that, despite the fact that the 'small' systems on show this year included small IBM and DEC mainframes. And it has to be said that the shows which the establishment knows, like the Hanover Fair, Systems in Munich and Scicob in Paris still attract the big names. But this is mere ignorance. Comdex has only been really big for two years, and the power of the big retail chains has still not dawned on many established computer companies. So they still don't come.

Earlier this year, at the National Computing Conference in Anaheim, the place was thick with British and overseas journalists.

There was barely anything of note to report—and what there was had been announced a couple of weeks previously. That is, it had appeared at Comdex Spring.

Here in Las Vegas, where I am writing this report in a Sunset Strip hotel, there are nearly 100,000 delegates from all over America, looking at the market for business micros.

The only journalists from Britain, apart from myself, are Tom Forenski from *Computing*, and the local *Financial Times* correspondent, Louise Kehoe. Our own Robin Webster, who lives in America, is here too.

The rest haven't heard of it, or don't realise it's important. And the result is, sadly, that British industry is missing the most important chance it can get, each year, to sell to America.

They haven't read about it, and haven't had the curiosity to investigate for themselves.

There *are* British firms here. There is a very big Apricot stand from ACT. There is a big stand with Rair on it, another big stand with Microfocus on it, and after that, a few small-time adventurous souls who have joined a coordinated booth.

They include people like Pegasus, Southdata, Xitan, and Intelligence UK. Each has set up a bleak little tent in the British ghetto. And I'm sure that the result will be better for them than sitting at home, but still, it's hardly an overwhelming presence.

And by comparison with the major displays, with lush carpet, upstairs hospitality suites, multi-stereo surround sound, five-foot monitors and live demos, mounted by American exhibitors, these brave exporters do look a little bit small-time.

The same goes for the big-mouthed Europeans.

Where is Holland Automation, whose executives explained to me, so kindly, why it was that they were right, and IBM was wrong?

Where is Nixdorf? Where is ICL? What is Sinclair doing? Do Ferranti and GEC have no dream of ever exporting computer systems? The answer: the promotions executives of too many of these companies work for bosses who cut their teeth at the NCC and Hanover. And the bosses aren't going to 'start getting involved with every little American trade show that happens to get a mention in *PCW*, you know.'



Akira Miyazawa, MD of NEC Business Systems (Europe), presented the APCs to two of the winners of the PCW/NEC competition in our October 1983 issue.

The third winner, Fergus O'Rourke from Cork in Eire will be receiving his machine from a local dealer.

Mechanical engineering graduate Tony Nobbs (second left), 24, has been an accommodation services planner for British Telecom for the last two years. Tony has been interested in microcomputing for several years:

'I've no idea yet what I'll do with the APC but obviously I'll have to find something more advanced than playing really neat games of space invaders.'

Richard Jackman (first left), 36, is an arable farmer from Martley near Worcester. He has a Nascom which he uses for price lists and fertiliser analysis and for games.

He will be putting the farm's accounts on the APC and hopes to do some accounting for other small businesses such as pubs and hotels in the area.

The competition involved listing 12 features of the APC in order of importance in contributing to business efficiency. Both winners said they drew up their lists in less than half an hour which is considerably less time than it took the judges!

Acorn acts

An important precedent in the fight against computer software piracy was established on 16 December in an out-of-court settlement of an action by Acorn Computers against Computing Publications.

Computing Publications agreed to pay £65,000 damages, plus costs, to Acorn Computers in respect of an article in the January issue of PCW which was considered to incite readers to duplicate computer programs. The article detailed a system for unlocking a built-in software protection device designed by Acornsoft to prevent copying.

Earlier in December Acorn was granted a High Court injunction requiring all copies of the January 1984 issue of PCW to be withdrawn from sale; this has now been lifted.

The agreed damages, to meet Acorn's expenses in developing a new locking device was accompanied by a joint commitment by the companies to the eradication of software piracy.

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The Permanent Computer Show



N·E·W·S·P·R·I·N·T

Natural language

The arrival of a 'natural language' option for Microrim's R:Base database could make data storage systems usable by casual operators.

The product is needed. It is easy for an expert driver to park a car: impossible for a beginner.

Similarly, a beginner finds it practically impossible to formulate questions for a database.

The information is all in there, and only two or three, simple queries will set the program to work, digging out the name or list of numbers or summary of expenses that you want.

But if the information is stored under 'title' and you ask for 'names' then you will get nowhere for a long time.

What Microrim's Clio aims to do, is to learn (by asking the user questions) what the enquirer has in mind. It uses 'expert systems' techniques to do this.

'Clio enables the user to query the database in his own language, rather than in "computerese",' said Wayne Erickson, who is president of Microrim.

The way the company publicity sheet put it: 'Clio allows the user to build a dictionary of synonyms for words or operations associated with a database.'

This dictionary building process is invoked whenever the user queries the database with a word or series of words not already in the database vocabulary.

Clio 'then responds with a series of questions to the user, to define the unfamiliar terms. Through this conversation,' the statement continues, 'new words are built into the database vocabulary.'

Clio also has the ability to search through the database to retrieve records based on adjectives, or other qualifiers.

'Where Clio becomes even more valuable,' Erickson claims, 'is when the user wants to define a word which is not related to something in the database. It allows the user to define words which are the result of computation.'

An example quoted by Erickson: if you ask for profit for a particular period, and profits are not actually entered into the database.

'The user would define profit as "sales minus expenses" where both sales and expenses are listed in separate parts of the database, to come up with the answers.'

Next step from Microrim is nothing if not ambitious: after adding graphics, Erickson wants to see Clio become 'the user's interface to the computer.'

What users of the future need to get them involved in computers is a system which has enough sense to work out what it is meant to do ahead of time.

There are many parts to this, but a vital one is the ability to see that the command D and the command Delete might be the same, while the command DI might be either 'directory' or 'display'.

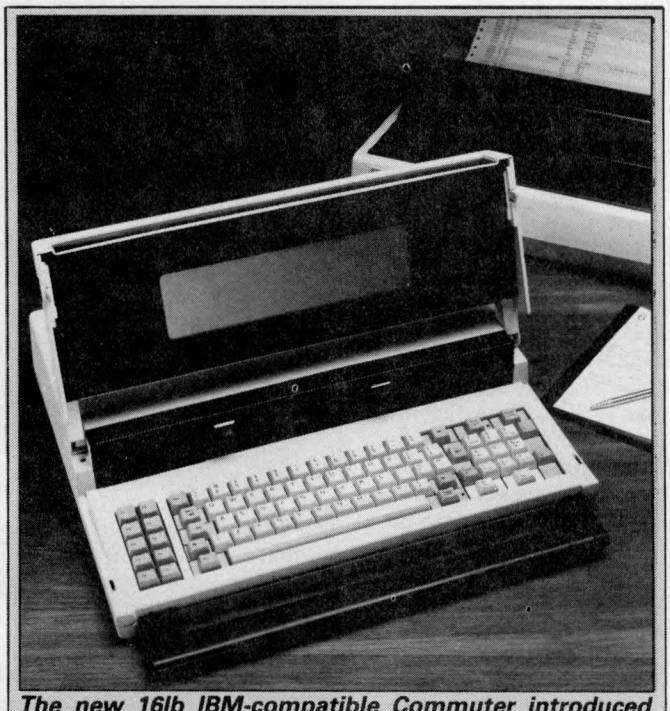
Current systems which will accept single letter commands will reject two-letter commands starting with the same letter as unknown.

And it is quite clear that Gary Kildall of Digital Research has never quite grasped how many enemies his bureaucratic operating system, CP/M, has made.

I will always think of CP/M as the sort of clerk who makes you fill out the form in triplicate, without carbon, and only when you have finished points out that the date is wrong on top of the first page. And then he won't let you rub it out, but makes you fill out the whole form again.

Clio costs under $200. The R:Base it reads costs $495.

Details from Microrim on (206) 453 6017 in Bellevue, Washington (nice and handy for Microsoft).



The new 16lb IBM-compatible Commuter introduced by Visual at Comdex.

Popular portables

Portable computers, a novelty two years ago, are now attracting serious research and development money, producing the 16-line, 80-column liquid crystal screen.

Everybody at Comdex seemed to have one. They ranged from nearly complete prototypes to nearly available systems.

The surprising thing was that some people with these ultra low-power screens didn't have them fitted to low-power computers.

Visual Computer's Commuter, for example, looks very like the Gavilan (see the preview Benchtest in this issue) which is a battery-powered portable.

But the Commuter turned out to have standard dual IBM-standard disk drives, and needed a proper mains power supply. This seemed a bit strange: with power available from the mains, there are compact flat screens which give much better visibility and much more detail than liquid crystal technology.

Both Gavilan and Sharp had caught on to the low power benefits of the big screen, and both had upgraded their eight-line displays to 16-line size.

Gavilan's is by far the more sophisticated and exciting design, apart from its 'mouse' pointing pad.

First of all, it has an 'integrated software environment' which means that programs run hand in hand with each other, as on the Lisa.

The machine includes a single Sony 3·5in micro-diskette, is battery powered, and the $4000 price includes three applications modules — test editor, spreadsheet, and comms.

The original Gavilan is now a cut-down version, at a reduced $3000 price, without the software, without the built-in modem and without Basic and Pascal.

Both machines do acknowledge the need for a bigger display (something none of its rivals will stoop to) by having a video output for a monochrome monitor, giving a full computer page. And both include MS-DOS as the operating system.

N·E·W·S·P·R·I·N·T

In June, when first demonstration units appeared, they were 'don't touch' machines: at Comdex, the Gavilans were freely available for finger-poking.

And software from outside vendors is available: WordStar, SuperCalc 2, PFS (personal filing system) Report, PFS File and Acculink are available now, and EasyWriter, Multiplan, SuperWriter, SuperComm, SuperPlanner, SuperTool and Business Manager are planned for the summer.

Weight of the Gavilan is nine pounds: an optional printer can be carried together or separately. And first production models are expected any day now.

The Sharp is the same model that appeared at the London *PCW* Show (Sept '83), and it uses bubble electronics, rather than diskettes, as its extension storage.

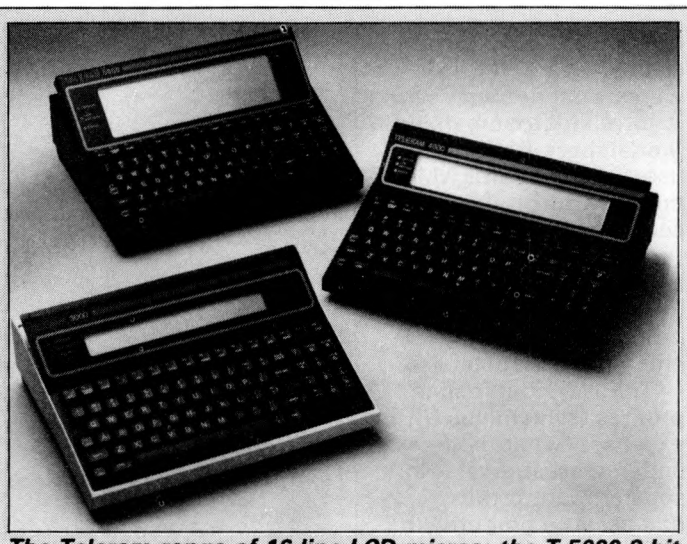
But though bubbles do give more storage, they can't be plugged into the computer the way disks can, so for a lot of potential users the lower price of the Sharp will be seen as a true measure of its quality.

The big LCD also appeared on a machine which looks so much like the Pied Piper that at first sight it looked like STM Electronics had copied the thing. It turns out that it is the Pied Piper's big brother, with MS-DOS, an IBM compatible disk, but a much faster 80186 processor inside than the IBM's 8088.

This machine (like so many American computers, like so few UK computers) includes a direct-connect phone interface — an auto-dial, auto-answer modem, which can switch from slow 300 baud to faster 1200 baud standards.

Cost of the STM is $3000, and a desk-top version at $2500 will also be released when the final design becomes available in April.

The last of the 16-line LCD machines was shown by Teleram, which had another bubble-based machine, the T-5000, at $2500.



The Teleram range of 16-line LCD micros: the T-5000 8-bit machine costs $2500 and uses the Zilog Z80L and CP/M-80.



The STM portable personal computer weighs less than 17lb and includes 256k of RAM (expandable to 512k).



The Chameleon micro, weighing 28lb, is marketed by Seequa as a low-cost IBM running 8-bit CP/M software.

Unlike the other portables, this one is an 8-bit design, using the Zilog Z80L and CP/M-80.

What makes the Teleram special is the fact that it can be used as a keyboard for the T-3500 desk-top computer, with lots of ordinary CP/M disk-based features (such as the ability to format Osborne single-density diskettes, or IBM CP/M-86 format diskettes) and software.

Another portable which attracted attention last year, the Corona, is now turning up for test with an interesting new feature — no carrying handle. This, given its impressive weight, was no bad thing. It may be more compact than an ordinary multi-unit dest-top computer, but not much smaller.

Texas Instruments also weighed in (ho! ho!) with a 33lb colour Professional portable. It is entirely compatible with the ordinary Professional, and costs an extra £500 in this country.

Somewhat easier to carry (28lb), the Chameleon from Seequa, launched a year ago, is now distributed through some 300 US outlets as a low-cost IBM with a difference — it can run 8-bit CP/M software, too.

Like the DEC Rainbow, the Chameleon has a Zilog Z80 chip inside it, as well as a 16-bit 8088.

The base price of the Seequa range is $2000, which is pretty competitive, except for the fact that it buys a single-disk, no-screen, box. Software available is mainly Perfect Software's range, plus the Condor database manager.

Price details were not available on the new hard disk system, just launched at Comdex, but Seequa promises to be 'aggressive'.

However, the US press appears not to have been totally smitten with the design, since it varies fairly radically from the IBM PC design, and compatibility is not its main feature.

Teleram is in New York on (914) 694 9270. Gavilan is on the US West Coast on (408) 379 8000 — but is about to announce 11 UK distributors. Chameleon is on (301) 672 3600. Visual is on (617) 480 0000. STM is in Menlo Park, on (415) 326 6226.

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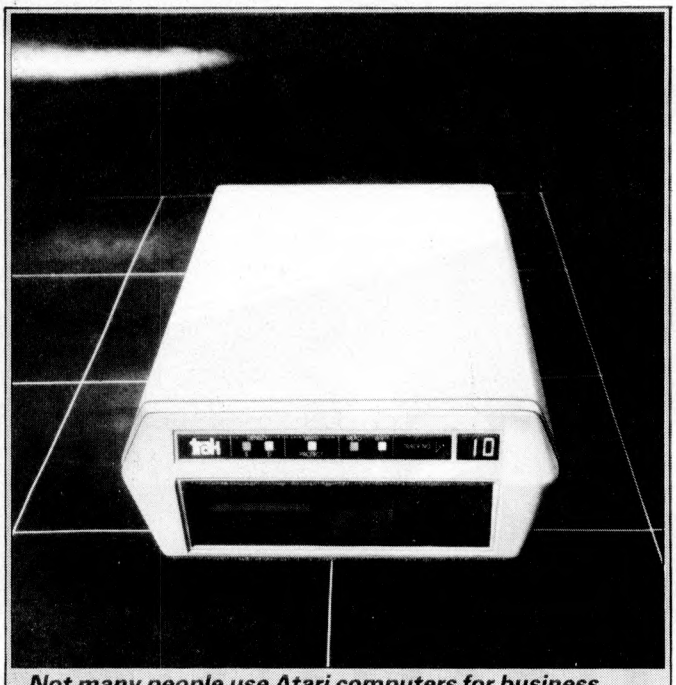
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N·E·W·S·P·R·I·N·T



Not many people use Atari computers for business, and Comdex was definitely a business show. So, I stopped short at the sight of an Atari on the Trak minicomputers stand.

Trak was selling an add-on diskette which (it said) had enough processing power to do lots of things that ordinary Atari diskette drives cannot do.

What struck me, however, was less disk-based: the thing has a deluxe version that includes a parallel interface, 'so you can plug your favourite parallel printer directly into the back of your disk drive — you do not need to buy an expensive interface module from Atari, a saving of at least $200!'

Trak is in Illinois on (312) 968 1716.

Window on the world

It has finally dawned on computer and software designers that Apple wasn't just tying pretty ribbons on Lisa when those windows were built in. They work. And everybody is now rushing to do the same thing.

At Comdex the windows were all there, and everybody was in agreement that it was 'The Right Thing To Do'.

Where the offerings differed, however, was on what you would see through the windows.

As usual, the world is divided into two. There are those who say that people want to run their existing programs under windows — and to run more than one program in the same machine, you need a sophisticated supervisor.

And on the other side, there are those who say that this isn't enough. They say that several large, complex programs will get in each other's way, and that you must, rather, re-write the programs in such a way that they fit together well.

Digital Research's Concurrent CP/M and Quarterdeck's DesQ are the two main 'run it as it is' programs. Visi On and MS Windows are the main protagonists of the 'slice them up smaller' approach.

MS Windows, however, does propose to allow the option of running existing applications, but Microsoft people stress that this will be less than optimum.

There were others, glimpsed in passing, showing only enough to make it clear that they were working on the same lines, and that nobody has to make their minds up yet.

This column is not the place to attempt the absurd prank of a serious comparison: let somebody else make a fool of himself trying to compare the relative weights of fire and air.

What can be said is that MS Windows does not exist. When asked why so many people had joined in announcing 'support' for MS Windows, but IBM had not, Bill Gates, Microsoft's chairman of the company, cheerfully retorted: '. . . because IBM doesn't pre-announce products. But we can. We won't have it until the end of April, and if IBM is going to announce support for windows, IBM would not announce it until then.

It seems that even Concurrent CP/M, although the company was able to demonstrate software running in all four windows, is not yet entirely foolproof. The evidence is the release of a new version of WordStar, the best-known text processing program, in a version for Concurrent CP/M.

Quarterdeck, like Digital Research with Concurrent CP/M, reckons that the users of DesQ will not want to run only one program at a time, and that while there may be an 'active' window, and other 'hidden' windows, the active window is not the only one where something is happening.

MS Windows, however, firmly aims to have no concurrency. Yet.

Interestingly, MS Windows has one thing going for it which couldn't have been easily foreseen. It is a 'standard' microcomputer product which ordinary computer companies like Honeywell can adopt (Honeywell demonstrated MS Windows at Comdex) without swallowing their pride. They do not have to follow IBM, which hasn't announced 'windows'. And they do not have to use CP/M, which they all denounced as a silly microcomputer thing in the days before there were many micros.

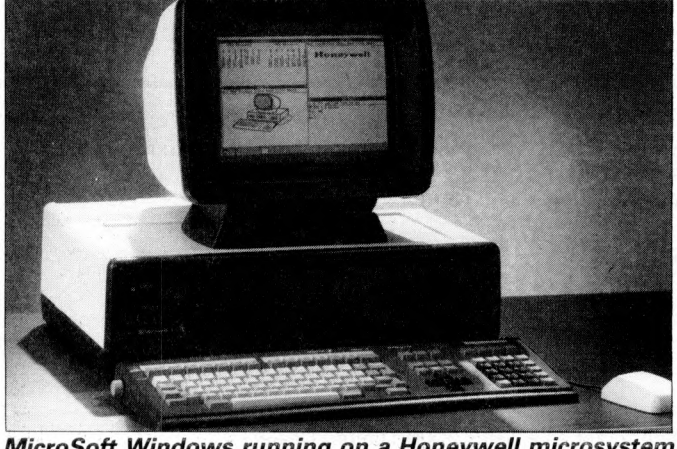
Visi On, since it requires Visicorp to re-knit the applications, is restricted in the number of programs it has. Not theoretically (the company says) but simply in terms of what programs they have so far got around to re-knitting.

The average UK computer user is likely to meet windows first in an Apple Lisa tutorial session, and starting in December, in a version of Concurrent CP/M supplied for the ACT Apricot (free with the machine).

All the rest will come when they are ready.

That, I'm afraid, will be some time after they are officially announced by distributors in this country.

The good news there is that Visicorp has held a press conference through its UK distributor, Rapid Recall. Even better, I've seen the



MicroSoft Windows running on a Honeywell microsystem 6/10 consists of a window manager and a mouse cursor control.

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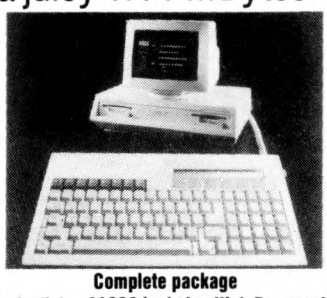
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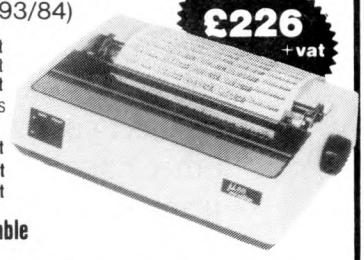
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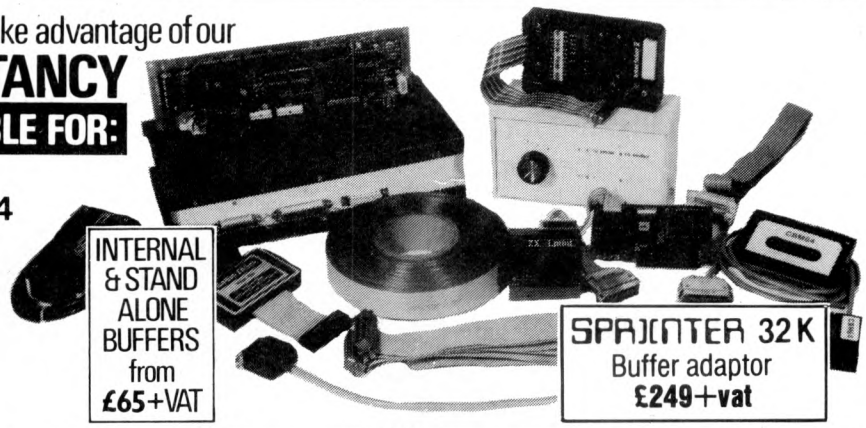
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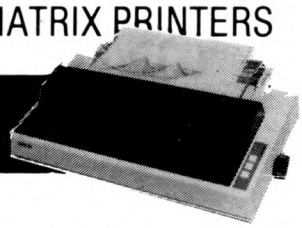


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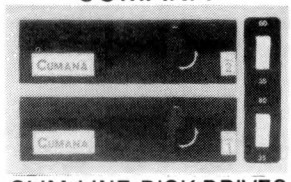
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thing working on more than just the IBM PC.

Unfortunately, the version on the Wang Professional isn't ready (Dan Fylstra, boss of Visicorp, crashed it himself during a demo!), and I didn't see one on the Victor/Sirius at all.

When I hear of a distributor for DesQ, I'll mention it. And as for Microsoft, given the company's terrible reputation as a supplier of boxes (a problem which executives tell me will be put right 'Real Soon Now'), when I hear of MS Windows actually reaching dealers, I'll be surprised.

➔➔➔

Pointing devices

In the wake of the windows crept hundreds of mice. Also on show were variants of other pointing devices—light pens, touch screens, graphics pads, handwriting detectors and the like.

The most original mouse was a verb. 'To mouse' means to stop using the Pencept Penpad as an input device, and to use it to control a screen icon, instead.

'Touch the pad with the point of the pen to select graphics,' said the Pencept demonstrator to his audience. 'Then put the point over the word, click it once, mouse over to the new position...'

As an editing tool this one is the best. The movements of the pen are interpreted, not just as graphics squiggles, but as writing.

So if you 'mouse' over to an incorrectly spelled word, (for instance, touch the 'correct' marker on the pad, and then write the new word on the sensitive pad), the computer will pick up your handwriting as if you had typed the word at the keyboard.

The drawback of the Penpad is the $700 price—and that is the 'discount' price asked for a development tool 'for software vendors interested in modifying their existing packages to use the Penpad, or in writing new packages which take advantage of the Penpad.'

Included in this price is the technical documentation needed to program the Penpad. And included also, free, is a copy of the Pencommand utility, with documentation. This does the very important, inconspicuous but technically very challenging, work of creating 'command areas' for any software package you may be writing.

The company has already picked up one customer: Ocean Data Systems Inc (OSDI). This software group 'will initially develop time-keeping and billing software, targeted at the legal market-place' and will also distribute this new software 'over a unique electronic distribution service, reaching over 200 speciality computer dealers, via OSDI's satellite communications network, which allows dealers to demonstrate the latest in software to their customers, without having to stock or purchase demonstration disks.'

This order is for 1000 Penpad units. Pencept describes itself as 'a supplier of artificial intelligence products that provides a more natural way for people to use computers'. The company is based in Waltham, Mass on (617) 893 6390.

Apple announced a mouse for the IIe. Everybody got very excited about this, but you needn't think just because you have an Apple II, you can start running integrated windows on your micro.

All this mouse does is draw. It's a nice-enough graphics program, which lets you plot points, fill spaces, and draft shapes, like LisaDraw does. It even gives you graphics control of words—new fonts can be picked and printed in varying sizes.

Release date of this £150 product (including graphics pad and mouse) is sometime in February.

A touch screen for the IBM micro was shown by MicroTouch Systems. 'Learning times are greatly reduced for novice users, while operating efficiency is increased for more experienced users,' says its publicity.

I remain to be convinced. I note that the warm welcome given by the micro industry to Hewlett Packard's HP150 has been taken universally as proof that users like touch-screens. In fact, the HP 150 is the first HP product to sell for rather less than the competition; normally the company charges very considerably more.

I suspect this may have a lot to do with the warm response. And I have been watching ladies with long finger-nails trying to make the touch-screen work, and watching people with greasy fingers trying to clean the marks off...

Following Microsoft, the Mouse Systems Corporation has announced that its Optical Mouse (which needs a special mirror to run on) works with all Microsoft mouse-driven programs, and also with Visi On. Apparently it also works with Lotus 1-2-3, and WordStar too, and all I can say to that is: if it works as 'well' with 1-2-3 as it does with WordStar, then I don't want one with my 1-2-3.

Mouse Systems is in Santa Clara on (408) 988-0211.

➔➔➔

Fast train to computer literacy

'Expensive paper-weights'—apparently that is the fate of around a third of the personal and business microcomputers bought 'because most business application software is so poorly documented that it is too hard to learn to use.'

This statistic was provided by a training company, Fastrain, which connects a tape recorder to a piece of software which demonstrates a program.

Despite its obvious vested interest in believing that a third of the computer market is open to their training product, designers Richard McMahon, Patricia McMahon and Gordon Gibson are probably onto a source of income.

One tale among many: a friend, working on assignment to a large corporation, was given an IBM personal computer from that corporation's bulk purchase of computers, together with the EasyWriter program, so that his files could be accepted by the company computers.

I believed there were five helpful and competent resources. IBM told him flatly that it was not in the least interested in helping a customer, and he should go to his local dealer. The biggest London dealer I know first abused him for asking to speak to the proprietor (a friend of mine) and then told him that it didn't do a course on EasyWriter, but would happily take £90 off him for a day's course on how to load and run software. The local Community Computer Centre said that it had finished a course on the IBM, and, goodness, it didn't know *when* it might run another. The National Computer Centre's staff said it couldn't handle training on so simple a subject as learning how to load and run diskettes, and a local dealer told him that he did run courses, but not for people who bought direct.

His troubles, when I spent twenty minutes helping him myself, turned out to be: two out of the ten brand-new IBM label diskettes were faulty, and would not format, and his diagnostic diskette, supplied with the system, was faulty.

No, IBM, I didn't phone up to check this story with you!

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★ Hotel bookings (for 48 weeks)	£35.75
★ Pharmaceuticals labelling	£38.75
★ Appointments Diary	£25.00
★ Statements (Print out to customers)	£39.00
★ Pro Calc (Newbrain financial spreadsheet	£34.50
★ PAYE full working pgm	£38.50
★ Surgery booking system	£39.75

VAT @ 15% should be added to each of the above (include 90p P&P per program)
Phone for your nearest dealer
Send large S.A.E.
for complete range of programs
ELSTREE COMPUTER CENTRE
ELSTREE AERODROME, ELSTREE, HERTS.
Tel: (01) 953 9021/6921

3 TIME-SAVERS

CACHE

MicroCache is a highly intelligent disk buffering system (cache) that dramatically boosts the performance of your microcomputer. It is totally transparent to the user, automatically monitoring your use of disks and quickly 'learning' what to hold in RAM. In this way disk accesses are very substantially reduced, saving you time and reducing frustration. **MicroCache** is available for most CP/M and MSDOS machines including IBM, Sirius, Apricot, DEC, NEC etc.

PRINTER BUFFER

Also included in **MicroCache** is a printer buffer. This enables printing to apparently occur immediately by 'printing to RAM'. Actual output to the printer occurs in background mode without delaying the user. The RAM used by the disk cache is dynamically shared with the printer buffer; whichever is causing you most delay automatically gets the most RAM. This is a much more cost-effective way of saving time than purchasing expensive add-on printer buffer boxes.

RAM DISK

Silicon Disk is the original 'RAM-disk'. It provides you with an extra 'disk' in RAM which is extremely fast and reliable. As with **MicroCache,** the **Silicon Disk** software will operate with any RAM that is suitable for your machine.

MicroCache	£125
(including printer buffer)	£195
Demonstration copy	£25
Silicon Disk	£95

WARNING: ONCE YOU HAVE TRIED THESE PRODUCTS YOU WILL NOT BE HAPPY USING YOUR MACHINE WITHOUT THEM.

microcosm research

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LONDON N1 8JU
ENGLAND
TEL: 01-226 9092
TELEX: 24263 TARDIS G

N·E·W·S·P·R·I·N·T

This sad tale, I'm sure, is unique: no other system ever fails in this way, and IBM has never supplied one like it to any other customer. Just an unfortunate coincidence that it was a friend of mine who happened to buy this rogue machine.

Still, I find the concept of spending $500 on Fastrain's system, plus $150 on each training kit subsequently bought, the sort of thing which individual users will fight shy of. I suspect that Fastrain will have to hope for interest from corporate central training departments.

Details on (617) 536 3003 from Fastrain at Electronic Protection Devices, 54 Sun Street, Waltham, Ma 02254.

➔➔➔

Sixth sense

Your plan is to write a program, in Pascal, or in 'C' and you are dreading the first pass through the compiler. There will be a million simple syntax errors, of the sort that any half-baked Basic interpreter wouldn't let you type.

You must immediately get Entry System for Programmers, ES/P.

It understands the syntax of the language you are typing. It won't let you type in upper-case letters where the compiler is going to want lower-case ones. It knows you meant to close the quotes that you opened at the beginning of the line. Brackets, too. And of course, in Pascal, you were going to type a semicolon just there, weren't you? It puts it in.

Actually, it's a pretty neat text editor. It lets you edit five different windows, so you can keep the top of your text on screen, and write on a different page without constantly flicking back and forwards.

Price of the ES/P package from Bellesoft Inc in Bellevue (near Microsoft), Washington 98004, tel: (206) 828 7282 is $249. For each additional language, you pay $100 to $200. You get a demo, a keyboard template, and one language free with the initial package. Fortran, Pascal, Ada and PL/M are on the way 'Real Soon Now', they say.

Yes, IBM micros only.

➔➔➔

IBM XT plug-in

I suppose the only surprise should be that nobody else did it first: from Ann Arbor, Michigan, PC Technologies has announced a plug-in system to turn the IBM XT into a multi-user system. PC says it is 'needed' but I suspect what it means is that there are lots of people silly enough to want it. Details on (313) 996 9690.

➔➔➔

No show

My heart went out to Precision Software, selling its excellent UK-developed software for the Commodore 64. If only Commodore had been at the show, one might have been tempted to take seriously its often repeated claims of being 'serious' about the business market.

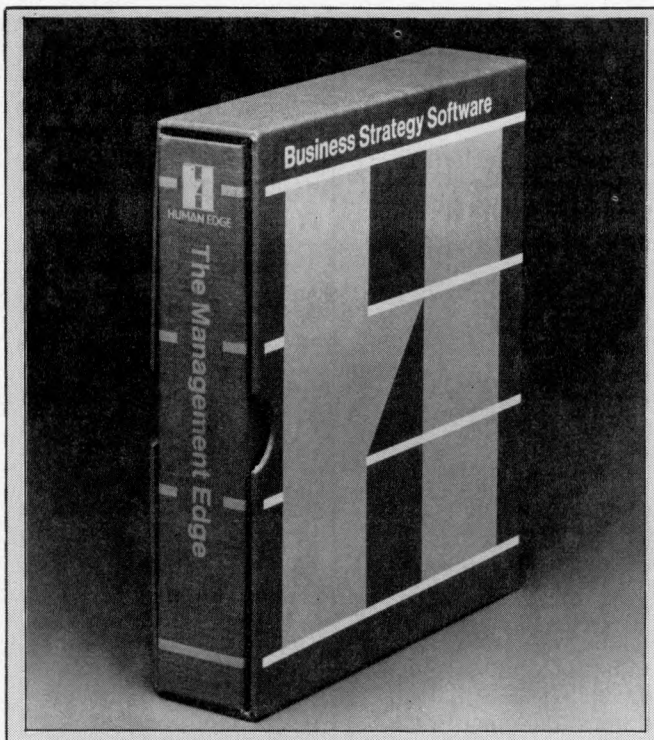
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Well adapted

The hardest gap for ZX81 users to cross before they can connect their computers to the phone network is not the fact that you need a modem. There are lots of those, and some are very cheap.

No, it's the difficulty of connecting a ZX81 to a modem.

For £30 (less five pence) an adaptor has now been announced by Microcomputer Resources



You're not going to believe this.

The Human Edge has launched a program 'which develops a problem-solving strategy tailored to the personalities of the superior/subordinate/peer triad, and to the culture of the work environment.'

Translated, this means that you go to the program with the following problem:

'Dear Aunt Computer, my boss is a mean old bully, and he wants me to get five thousand labels printed by Thursday. But my colleague Peter is using the computer to play Space Invaders, and he thinks the mailing list isn't really that urgent. Now I'm a very quiet little thing, and I can't tell Peter what I think of him, and anyway, in this stupid company you have to be the chairman's nephew or a beautiful person to get on, so how are we going to get the labels printed? What am I going to tell the boss?'

To use the program, you turn the machine on 'and choose from six assessment selections: self-assessment, interactions with others, compatibility with the organisation, problem-solving with subordinates, determining your management skills and assessing a superior.'

After the user answers a series of questions, says the company, 'the machine assimilates information from a bank of proven management tactics, and selects those most appropriate to the situation.'

Dr James Johnson, president and founder of Human Edge Software, and the author of over 100 articles and books on personality assessment, says 'The Management Edge offers a new method of understanding and communicating with co-workers, subordinates and superiors, by presenting expert management advice that can enhance a manager's overall performance.'

Not greatly to my astonishment, friends who tried this out report that its print-outs are pure nonsense.

If Americans will buy this sort of stuff, then no wonder they all see psychiatrists. They're all mad! And no, I am not making it all up, and yes, you can buy it, for $250, from Human Edge Software Corporation, 2445 Faber Place, Palo Alto, California, on (415) 493 1593.

of St Albans, which will let you use either Micronet (Prestel standard) modems or normal bulletin board modems.

The adaptor includes software to transmit characters at the right speed, and to display the incoming messages on the screen.

For Prestel standard, this is actually quite complex, as there are graphics, and there are double-height characters, flashing characters, and so on, to be interpreted.

Suitable Prestel modems are available from Prism Microproducts and a cheap 300 baud modem, for such things like British Telecom Gold, is available form Dacom, in Milton Keynes.

Microcomputer Resources is on (0727) 72917, and the address is 1 Branch Road, Park Street Village, St Albans, Herts.

➲➲➲

ITV micro dies sudden death

The full specification of the ITV micro should have appeared in this month's column.

But my latest information is that the project is dead, and since many people were caught in two minds about whether the idea was a good one or not, it now seems merely of historical interest.

That the project is dead is still in doubt in some circles.

My own information, by press time, was that the Independent Broadcasting Authority regarded the idea of a sponsored ITV microcomputer as the thin end of a wedge which it is legally bound to prevent splitting its integrity.

In this country, unlike America, there are no 'programme sponsors' who own the rights to a series. The system has been widely abused in America, where sponsors have taken it upon themselves to direct what shall and what shall not appear in 'their' broadcast programmes.

By having a programme about a particular product, and a series of programmes about that product, the IBA feels it would be treading on the wrong side of the legislation which gives the Authority its authority. Officially sponsored programmes might not appear (at first) but there would be heavy pressure to have unofficial forms of patronage, and humans cannot always be guaranteed to resist temptation.

The sad thing about the project is its possible effect on 'Prestel in Schools'.

For some time now, a secret battle has raged between two Government Departments — the Education people, and the Trade and Industry people. Trade and Industry wants to put a Prestel-based computer (Micronet is the obvious candidate) into each classroom, or failing that, at least into each school.

But the Department of Education, for good and for less good reasons, is totally opposed to this.

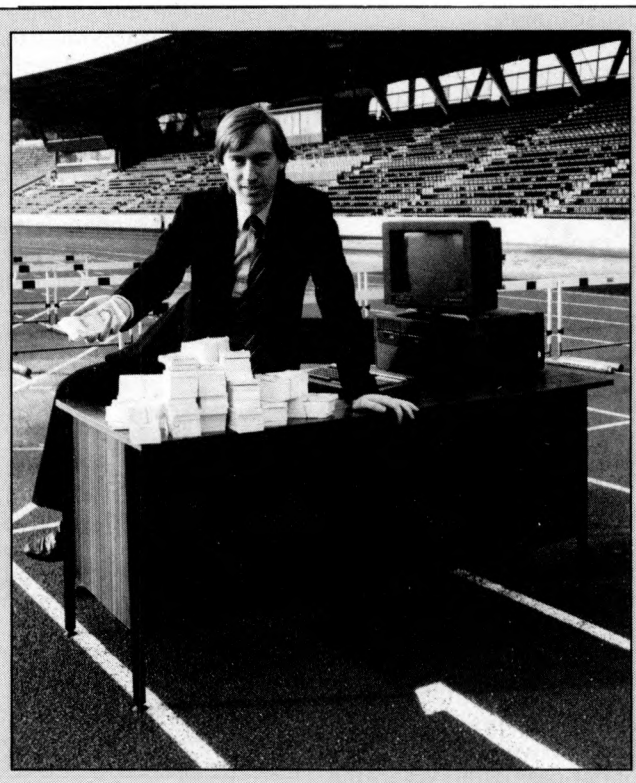
The ostensible (and a major) reason for opposing Prestel in Schools is the simple fact that Prestel uses a grotty telecomms standard. You can receive data at 1200 baud, about 130 characters per second. But you transmit them back to Prestel computers at a mind-numbing 75 baud.

Micronet modems, of course, offer the alternative of transmitting at 1200 baud, too — but only if the other computer is silent. Normal transmission requires the other computer to 'echo' each character on a different note — but the Prestel systems uses the same tones to answer as they do to transmit.

The very sensible observation that this restricts technology, and that the more flexible system used by British Telecom Gold should be preferred, is not the whole story, however. It must also be said that there are people in the DES who would go for a long walk rather than ride on a DTI bandwagon, and others who bitterly dislike and distrust one of the personalities behind the Prestel in Schools scheme, the people at Micronet, and in Prism.

With the ITV micro being a Micronet machine, and with a series of Channel 4 educational broadcasts supporting it, the Prestel in Schools scheme would have received a tremendous boost. And, despite all my reservations about the ultimate perfection of the microWren, a cut-down version of the Micronet Business Computer to be launched shortly, I feel very disappointed that cheap Prestel is now likely to be withheld from our schools.

Anyway, the ITV micro is almost certainly dead. Three independent TV companies expressed more than minor



Publicity stunt

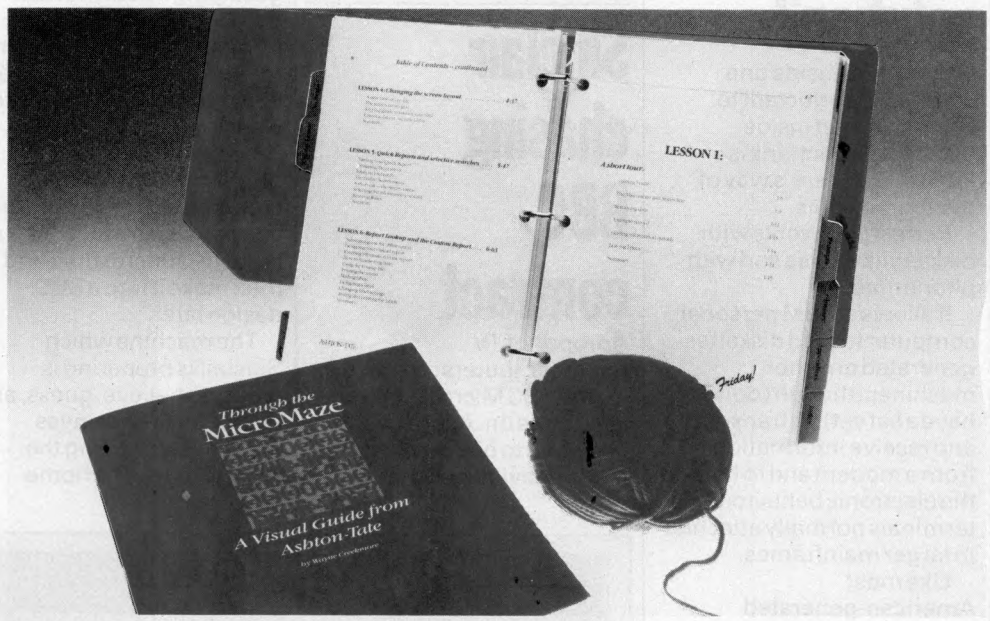
Only one brave person applied for a free computer under Tycom's publicity stunt 'competition' which ended in November — and Tycom judged that this hero didn't qualify.

This is Allen Timpany, boss of Tycom, waiting for comers as time ran out.

He failed to find a computer from IBM, ICL, DEC, Sirius or Apple costing less than £2900 (excluding VAT) which could grow to a six-user minicomputer, with the six most popular operating systems.

The stunt is worth mentioning because Timpany has a valid point. Most multi-user minicomputers, even when based on microprocessor chips, can't usefully be bought as personal microsystems. And most personal microsystems are very poor performers when stretched into multi-user mini shape.

The easy way out of the micromaze.



If all Theseus needed to find his way out of the maze was a ball of thread, why hasn't the computer industry come up with something just as simple to navigate the micromaze?

At last it has. Ashton-Tate's book Through the MicroMaze is as valuable to the novice computer user as that ball of thread was to Theseus. It takes you right through the maze and back out again, arming you with the knowledge to protect your business against the evil forces of poor software.

Through the MicroMaze comes with FRIDAY!, software that demands no prior knowledge of computers. With FRIDAY!, you quickly turn your paper files into electronic files. It handles Mailing Lists, Invoices, Cheques, Sales, Inventory, Reports and just about anything that needs to be done.

With FRIDAY!, understanding is immediate. Through the MicroMaze provides the first stage in getting a computer to run your day to day activities. FRIDAY!'s manual takes up the story with a step-by-step tutorial. By the time you've worked through that, you will be running your own applications.

First-rate documentation, simple menus and masses of help on the screens gives you a desktop file management system that is both powerful and easy to use. It works with other software too – with WORDSTAR, with 1-2-3 and, best of all, with dBASE II. So as your business grows your investment in computer software is protected.

If ever there was a complete package for the beginner it's. . . . .

Friday!™

ASHTON·TATE

Supported by: Ashton-Tate (UK) Limited, Cofferidge Close, Stony Stratford, MK11 1BY.
CALL: 0908 568866

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N·E·W·S·P·R·I·N·T

reservations about it, and the IBA would only have considered it seriously if there had been total unanimity. There wasn't.

Perfect solution?

Information inside one computer is reluctant to leave it and get inside another. Perfect Link is Perfect Software's way of overcoming this.

Perfect Link works with disks, with cables and with phone lines.

It allows an IBM personal computer to read diskettes generated on other machines (though I don't have a list yet), to transmit and receive information from a modem and to imitate the electronic behaviour of terminals normally attached to larger mainframes.

Like most American-generated programs, its authors remain blissfully blind, however, to the need for a version that will run on the ACT Sirius.

I gather that, informed of this need by its new UK boss, Chris Gare, the US programmers are now 'Working On It' and will have it (as Jerry Pournelle always says) 'Real Soon Now'.

You can contact Perfect Software on (0908) 660466.

Market research

Market researchers were one of the first groups of specialists to make a grab for computers to help analyse their surveys: a special study group on software for survey analysis has done a survey of available programs.

The survey has been carried out for several years, but this year, it's different. For the first time, micro-based packages make up a substantial part of the list of over 100 programs—'almost a majority', notes the report.

The report is available for £2.50 from the Study Group on Computers in Survey Analysis, c/o D Cable, CSO, Great George Street, London SW1P 3AQ.

Sinclair chasing BBC contract

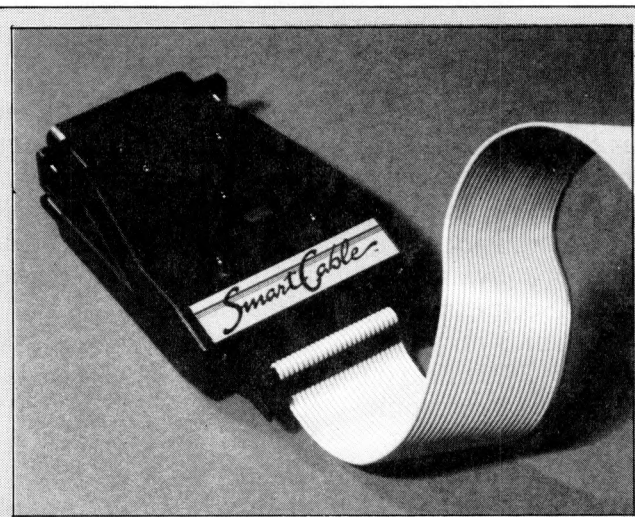
Apropos of TV microcomputers: the race for the BBC Micro, 1984 version, is on. Acorn has been told to be on its very best behaviour, so that nobody can hold the BBC up to ridicule in the run-up to its re-appointment. But the idea of a Mark II BBC Micro is now being seriously considered, and one candidate is the next Sinclair home micro.

Hardly worth mentioning, you may think, but for one thing. Everybody is gossiping about the next Sinclair micro as if its imminent announcement meant that you could save your money for a few more weeks, and buy that.

Forget it. Sinclair is offering it for the BBC contract (as one option) and you can be sure that the plan is not to launch it first, and then make it into a BBC design later.

The machine which Sinclair is preparing is (sources believe, guess, and estimate) the business microsystem, using the MicroDrives. The home system is expected to be announced in April. When it will be available is as much your guess as mine.

If you want to buy a micro, buy one that is actually in the shops, not one that looks good on the drawing board. Drawing board micros aren't much cop at running software.



When your dealer tells you that 'The RS232 interface is a standard, so you will be able to plug in any printer, of course', show him this 'Smart Cable' which you may have to use to sort out the problems.

Normally, people who have a serial printer and a modem need two cables, because the two RS232 cable connections have two points reversed when talking to a modem.

Quite often, RS232 interfaces include extra lines to perform extra functions.

And quite often, the lines don't do exactly what they ought to, because somebody has 'improved' the RS232 idea.

This cable, say the makers, plugs between computer and 'device', watches the signals and then adjusts itself to send the right signals to the right wires to make the other end work.

Details from DNCS, on (061) 653 0777.

Computers for the blind

The first computer designed specifically for the blind and providing user access to word processors and spreadsheets has been launched by Maryland Computer Services.

The ITS (Information Thru Speech) is basically a Hewlett-Packard 125 with a sophisticated speech unit built into the monitor's plinth. The system, complete with twin 3½in drives and manuals in braille and normal type, costs about £6000—although the Manpower Services Commission will subsidise the cost in deserving cases.

The speech unit has an unlimited vocabulary and the rate of speech can be varied (between 45 and 720 words per minute) as can the pitch, tone and volume.

If a word doesn't follow standard rules of English pronunciation then the user can define how it will be spoken. This facility allows for the use of jargon and can even be utilised to form an instant language translator.

The 42 different speech functions, which are accessible via the function keys and numeric keypad, allow the user to request the speaking of any word or line and can even have a word spelt out to check its spelling.

The ITS can be connected to a variety of printers including one to produce braille output. This printer

ASHTON·TATE ■ dBASE II

The world's leading micro database package can now be enhanced with 3 new products

Fox & Geller, the world's largest suppliers of dBASE II add-ons, are now established in the UK to supply and support

QUICKCODE™

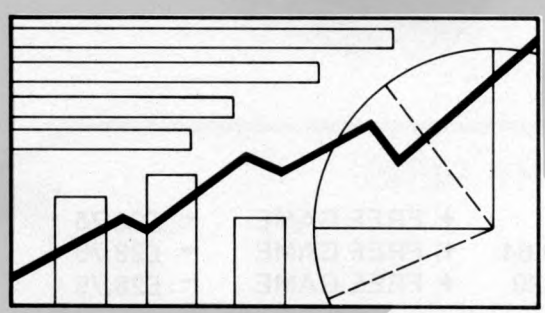
The dBASE II program generator. QUICKCODE writes concise programs to set up and maintain any type of database. You still have all the power of dBASE II and there is no programming required. Draw your data entry form on the screen and you're in business – it's that simple. The most powerful program generator available. And the easiest to use. **QUICKCODE makes dBASE II easy.**

dUTIL™

The dBASE II utility program. dUTIL automatically combines your dBASE II command files, saving disk access time and speeding up your programs. dUTIL makes your listings more readable by automatically indenting and aligning command sequences. Makes debugging that much faster. dUTIL also cuts out repetitive programming. Simply type your instruction sequence into a standard text file – then INCLUDE it in as many dBASE II command files as you wish. **dUTIL makes dBASE II faster**

dGRAPH™

The dBASE II graphics system. Now you can bring your dBASE II database to life! Produce pie charts and bar or line graphs in minutes and with ease. Advanced features make dGRAPH as powerful as it is easy. Features like autoGRAPH which will automatically load dBASE II data, compute scales, draw grid lines and label charts. Then there's automatic shading and overlay graphs. And more.



Easy to use dGRAPH makes dBASE II better to look at

Dealers - contact your Fox & Geller distributor for more details:

Encotel	01-680 6040	Soft Option	(0476) 860171
Ferrari	01-751 5791	Tamsys	(Windsor) 56747
Midlectron	(077382) 6811	Tradesoft	01-627 1800
Pete & Pam	01-769 1022	Xitan	(0703) 334711
Softsel	01-844 2040	Software Ltd	01-833 1173

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Home Computer Centre

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Tel. 051-727 8050

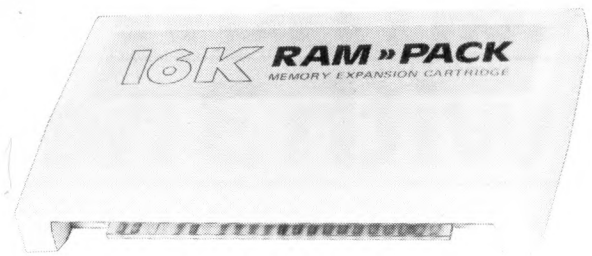
ASTERFRET TRADING LTD. INCORPORATES HOME COMPUTER CENTRE

VIC 20 and CBM 64 are reg'd trade marks
Commodore Business Machines

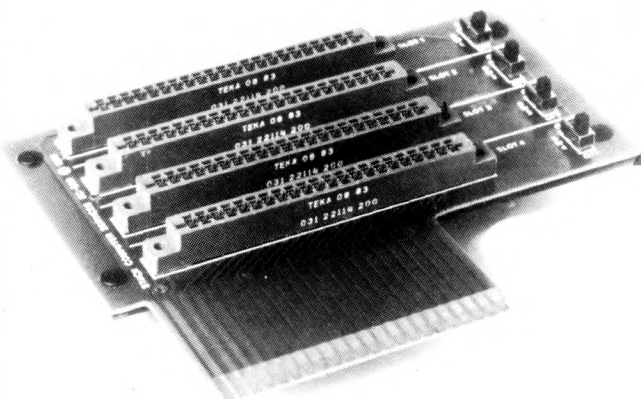
SPECIAL OFFER

RAM PACKS

VIC 20 16K STANDARD	– £27.95
VIC 20 16K SWITCHABLE	– £35.95
VIC 20 32K SWITCHABLE	– £49.95

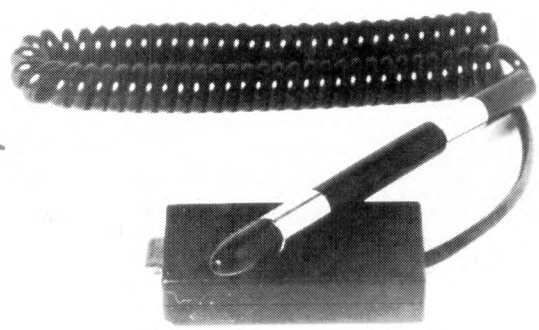


16K STANDARD
£27.95



MOTHERBOARDS

VIC 20 4 SLOT SWITCHABLE	– £28.95
CBM 64 4 SLOT SWITCHABLE	– £29.95



LIGHT PENS

BBC	+ FREE GAME	– £28.75
CBM 64	+ FREE GAME	– £28.75
VIC 20	+ FREE GAME	– £28.75

Please allow up to 21 days for delivery. All prices include V.A.T., postage and packing.

If you wish to be added to our mailing list, please tick the appropriate box

- ☐ VIC 20
- ☐ CMB 64
- ☐ BBC
- ☐ Lynx
- ☐ Dragon 32
- ☐ ZX Spectrum
- ☐ Electron

PLEASE SEND ME

Qty

- ☐ 16K Std. Ram Pack
- ☐ 16K Switchable Ram Pack
- ☐ 32K Switchable Ram Pack
- ☐ VIC 20 4 Slot Motherboard
- ☐ CBM 64 4 Slot Motherboard
- ☐ VIC 20 Light Pen
- ☐ CBM 64 Light Pen
- ☐ BBC Light Pen

Name _____
Address _____
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_____

I enclose Cheque/PO for £ _____

Home Computer Centre

N·E·W·S·P·R·I·N·T

costs about £2500 and is compatible with any RS232 microcomputer.

The ITS is manufactured by Maryland Computer Services and is distributed by John Bradburn Ltd. Details on (0604) 55142.
Tony Hetherington

Spectrum disk drives

One of the first 5¼in disk drives is available for the Spectrum at £245 including interface, controller and a sample floppy.

Until now the chief option for mass data storage on the Spectrum has been the elusive MicroDrive (85k for £80).

Each floppy disk has an approximate formatted capacity of 108k and an access time of three to four seconds for a 48k program. According to Chris Taylor, managing director of Interactive Instruments, a 32k program loads or saves in two seconds. The MicroDrive takes eight seconds to load a similar program.

The Viscount drive is apparently designed with the novice in mind and has simple file-handling commands. Programs arrays and code (blocks of memory) can be SAVEd and LOADed and the programs can be set to autorun.

A second 40-track drive, or alternatively two 80-track drives, can be used to form an expanded system with a maximum formatted capacity of 880k for about £700.

Production is currently running at 2000 units a month with the drives being retailed through the Spectrum Computer Centres.

Interactive Instruments is currently working on a CP/M/Video controller card for the Spectrum and has plans for a £40 robot arm.
Tony Hetherington.



These two famous men, Sir Clive Sinclair and The Right Honourable Harold MacMillan, OM, are out to teach our nation's children about science.

The computer baron and the publishing baron have launched a new range of educational software 'aimed at teaching 5-12-year-olds reading skills and science concepts,' they say.

Nine program titles are available, costing just under £10 each, available by mail order from Sinclair — not in Cambridge, but in Camberley.

The address is: Stanhope Road, Camberley, Surrey, GU15 3PS.

Misleading advertising

Acorn Computers has been taken to task by the Advertising Standards Authority. Three complaints by members of the public were upheld by the ASA in investigations concluded in August '83, on the grounds that claims were likely to mislead or could not be substantiated or that goods were not available. Complaints about Acorn's advertisements were upheld in two previous instances in the preceding 12 months.

The claim in the national press that 'the BBC Micro is in 80% of all British schools that have micros' was the cause for one complaint. Acorn said that 'the reference to the number of computers in British schools had been based on current orders being taken under the Department of Industry "Micros into Primary Schools" scheme.' Since no figures were available for the number of microcomputers which were not ordered under the DoI scheme Acorn agreed to qualify the statement in future advertisements.

Another objection was to the claim in a specialist press advertisement that 'with special adaptors you will not only be able to turn your TV set into a Prestel terminal and Teletext receiver, but you can also take data and programs direct from these services . . . This is another first for the BBC Micro.' The ASA investigation revealed that the Teletext adaptor had only been available to schools, in limited production, since February 1983 and for Prestel since April 1983. Acorn said it would soon be launching its own adaptor so the facility would be more widely available. It also said the statement 'another first for the BBC Micro' was not unreasonable since the adaptor for the Research Machine 380Z had only been available as part of a pilot scheme. The ASA disagreed, as 'the complainant had been using a Prestel adaptor in conjunction with the RML 380Z for some months prior to the limited launch of the adaptor for the BBC machine.' It asked Acorn to delete the claim from future advertisements.

The third complaint was about non-availability of goods advertised including the Prestel and Teletext adaptors, the 6502, Z80 and 16032 second processors.

One of the people complaining believed ROM cartridges containing games, speech synthesiser and Pascal were also not then available. Acorn defended its mention of these items saying it wanted customers to realise the expansion possibilities of the machine. It said it would soon make the items available and equivalent products were already independently produced by other companies. The ASA considered 'the advertisement did not make sufficiently clear that these items were not generally available from the advertisers, who were requested to clarify the position regarding availablility in future advertisements.'

Another investigation concluded by the ASA at the same time was into an advertisement for the Commodore 500. The claim that it can be used with any TV or monitor was found to be likely to mislead since an RF modulator is required if the Commodore is to be used with a standard TV set. Commodore agreed to amend the claim if it repeated the advertisement.

Oric Computers had not checked the facts it included in an advertisement in the specialist press which led to a complaint. Oric quoted an endorsement from 'Which Micro?' which contained an inaccurate reference to the Spectrum rather than the ZX81, saying 'instead of the



APPROVED for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use.

Everything's remotely possible with Telemod 2. At around £84.

Telemod 2 takes you and your micro into a whole new world of possibilities and opportunity.

Take Prestel* for example. For news, travel and holiday information, Teleshopping, Homebanking, Telex, and CitiService financial information.

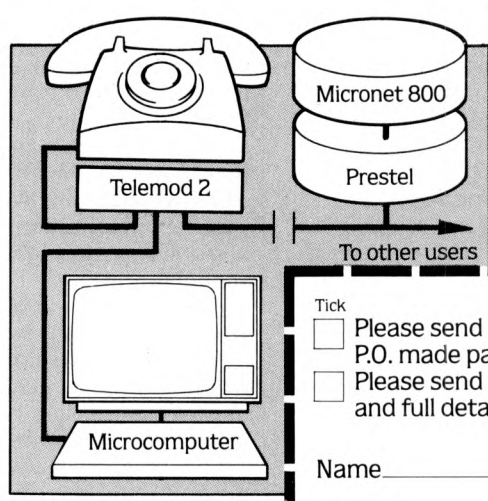
Or explore Micronet 800, where hundreds of free games are yours for the choosing, as well as an ever-expanding range of educational, household and business software.

Take advantage of electronic mail by exchanging messages and programs with other users – anywhere in the world!

The Telemod 2 from OEL (Europe's largest volume manufacturer of modems) uses advanced IC technology to bring universal communications with enhanced reliability – at a down-to-earth-price.

To make the most of Telemod 2, we offer a comprehensive choice of viewdata communications packages for popular micros such as BBC, Apple II, and IIE, CBM 3000, 4000, & 8000–64 and Tandy Models I & III. These packs contain appropriate interfaces and software, any necessary connectors, and full instructions. Prices range from around £15-£60.

With Telemod 2, you can simply turn the remotest possibilities into reality. Just return the completed coupon first.



Tick

☐ Please send me the Telemod 2. I enclose a cheque/P.O. made payable to O.E. Ltd for £84.95 inc. VAT.†

☐ Please send me more information on the Telemod 2 and full details about communications packages.

Name_____

Address_____

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Spectrum's 28 look-up single character error reports, the Oric has 18 self-explanatory messages.' The ASA upheld the complaint.

The moral of the story is: don't believe everything you read—especially in advertisements, but editorial has been known to be wrong, too.
Margaret Spooner

Low cost daisywheel

The Silver Reed EXP 500 daisywheel printer was announced at Compec and launched simultaneously in the UK and Japan. The Centronics version will cost an amazing £295, and a serial version is also available for about £325.

Only three print wheels are currently available, with Courier 10 and 12 pitch and Gothic mini typefaces—Courier 10 is supplied as standard.

If you are worried about the robustness and durability of this cheap daisywheel, reassurance can be had from Peter Ford, general sales manager of Silver Reed (UK) Ltd. 'The new printer is entirely based on two Silver Reed typewriters. The circuit board is the same as the one used in the SR X44 compact electronic typewriter, which has 60% of the UK compact market. The print system is based on Silver Reed's EX 55 Office typewriter, another market leader.'

The printer is available as the DW14 from the Dyneer Corporation, which showed the machine at Compec. Dyneer can be contacted on (0753) 72331 for more details.
Jerry Sanders

Oric expansion

Oric Products has raised £4 million working capital for expansion and product diversification. The company has been taken over by Edenspring Investments which has injected £2 million and the rest of the money comes from an over-the-counter sale of shares.

Oric expects a turnover of more than £10 million in its first year of trading but was unwilling to estimate profits. After 10 months to the end of October it had shipped 120,000 Oric-1 home computers, half to overseas markets.

New business communications and opto-electronics systems are being developed at Oric's research and development centre in Cambridge. Inmos, the semi-conductor manufacturer, will supply dynamic RAMs to use in micro-based prducts and will co-operate in the design of future products.

John Tullis, chairman of Oric, and its managing director, Barry Muncaster, both of whom were founders of the company, have joined the board of Edenspring and two Edenspring board members, Peter Jones and Nicholas de Savary, are now on the Oric board of directors.
Margaret Spooner



In very hot and dusty countries, where the mains power supply flickers and jumps, normal microcomputers are a hazard to the temper. They keep stopping, destroying the work of the past few hours.

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And it will stand hot climates, because it has two extra-powerful fans pulling air through those filters, onto the hot spots inside.

It's the Midas 2D/TE, a standard CP/M or CP/M Plus machine: details about it from Lionel Moon, Sirton Computer Systems, on 01-640 6931.

Aims to please

A combined database, spreadsheet and report generating program used by NASA to schedule Space Shuttle cargoes is now available to UK Wang and IBM PC users.

AIMS (Automatic Information Management System) was first launched in the US in 1979 for the Wang 2200; since then it has clocked up sales of over $5 million and earned the only 'Wang award for technical excellence' ever bestowed on a program.

The product was developed by AIMS + Plus of Austin Texas whose founder is Tim Veard, an ex-US Defence Dept war games and AI expert. Veard intends the acronyn AIMS to stand eventually for Artificial Intelligence Modelling System, because his intention is to build further on the program and increase its ability to manipulate administrative and accounting systems.

At present AIMS combines database and spreadsheet functions with automatic file design and statistical analysis data. An onboard package can display analysed data graphically and include the charts in printed output.

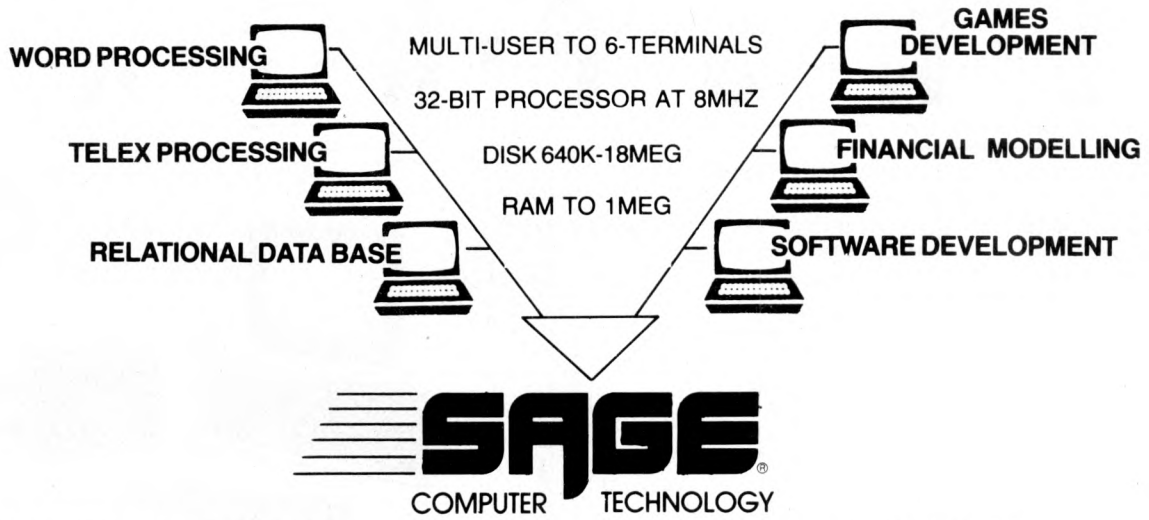
AIMS will retail in the UK for 'around £480', according to Roger Perring of Thames Computer Services (01-609 8008) who is distributing the package in the UK. (Watch out for Kathy Lang's full database Benchtest later this year in *PCW.*)
Jerry Sanders

Games Special apology

Steve Mann wrote the reviews in the January* Games Special *on Aquaplane and Maziacs (Arcade Games) and Plunder (Strategy Games) which were erroneously credited to Tony Harrington.

The articles in the* Games Special *were commissioned by Tony Harrington whose name was omitted from the credits.

PCW apologises to Steve and Tony for not acknowledging these contributions.
Margaret Spooner.



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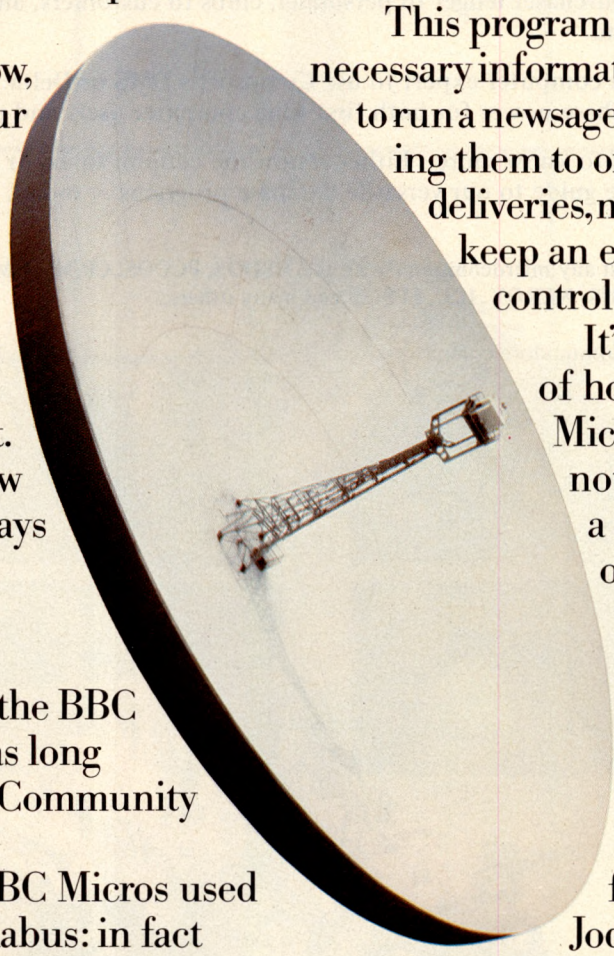
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Not all home computers stay at home.

The BBC Micro is the ideal family computer–simple to operate, yet fast, powerful, with enormous potential.

But it's nice to know, when you buy one for your home, that the business, educational and scientific worlds agree with your choice.

Here are a few stories to illustrate how the BBC Micro gets out and about. And one to remind you how helpful it can be when it stays at home.



A practical lesson in business admin.

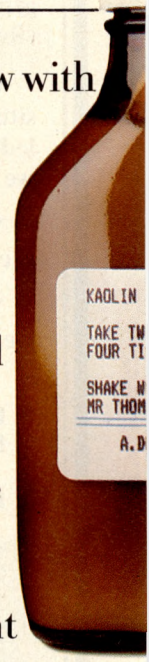
The contribution of the BBC Micro in the classroom has long been recognised at Perins Community School in Hampshire.

The School has 12 BBC Micros used extensively across the syllabus: in fact some pupils are using them to study for their GCE O Levels in computing.

One of the programs available to Perins teachers such as David Beck, pictured below with his class, is "Newsagent."

This program contains all the necessary information for the class to run a newsagent's shop; allowing them to organise daily deliveries, make up bills and keep an eye on stock control and ordering.

It's a nice example of how the BBC Micro can be used not only to acquaint a class with the language of computers, but also with some of the realities of the community in which they live.



Correcting Jodrell Bank.

The BBC Micro is a familiar worker around Jodrell Bank.

You'll find it in the reception area explaining the workings of a radio telescope to visitors, for example.

But it's also been helping in a more testing task: to improve the performance of the Defford telescope.

In this application it has been used to make calculations necessary to determine the precise parabolic shape of the dish.

Theodolites are used to do the measuring–then the BBC Micro works out the necessary corrections.



The end of the scrawl.

If any of you have noticed how much easier it is to read and understand labels on drugs and medicines these days, then you can most probably thank the BBC Micro. John Richardson, a Preston pharmacist, was first to realise how a micro with a suitable printer could produce labels that were accurate and legible and which could include, automatically, such information as drug reaction warnings.



At the same time it could record drug usage for better stock control.

He chose the BBC Micro for its versatility and potential for expansion.

John Richardson believes that this system will be recognised as standard in the profession and be used in hospitals, health centres and pharmacies throughout the UK.

Meanwhile back at home.

Dr. & Mrs. Yarwood bought a BBC Micro as a birthday present for their 12 year old daughter.



However, it quite quickly became common property.

All three can now write their own programs. Mrs. Yarwood is particularly proud of one program she has compiled to help teach her daughter French vocabulary.

They all agree that although the Micro is fast and powerful enough to be at home in Jodrell Bank, it is also the ideal computer at the Yarwood home: simple to set up (virtually any TV set and cassette player is all you need) and simple to use.



All this for only £399.

The BBC Micro comes with a comprehensive, step-by-step User Guide which introduces you to your micro and shows you how to construct useful programs of your own.

You will also receive a free "Welcome" cassette which contains 15 different programs for you to experiment with, ranging from music and graphics to games like Kingdom and Bat 'n' Ball.

The BBC Micro is available from W H Smith Computer Shops, Boots, John Lewis and local Acorn stockists.

Alternatively if you would like to order one with your credit card or if you want the address of your nearest supplier just phone 01-200 0200 or 0933-79300.

The BBC Microcomputer System.

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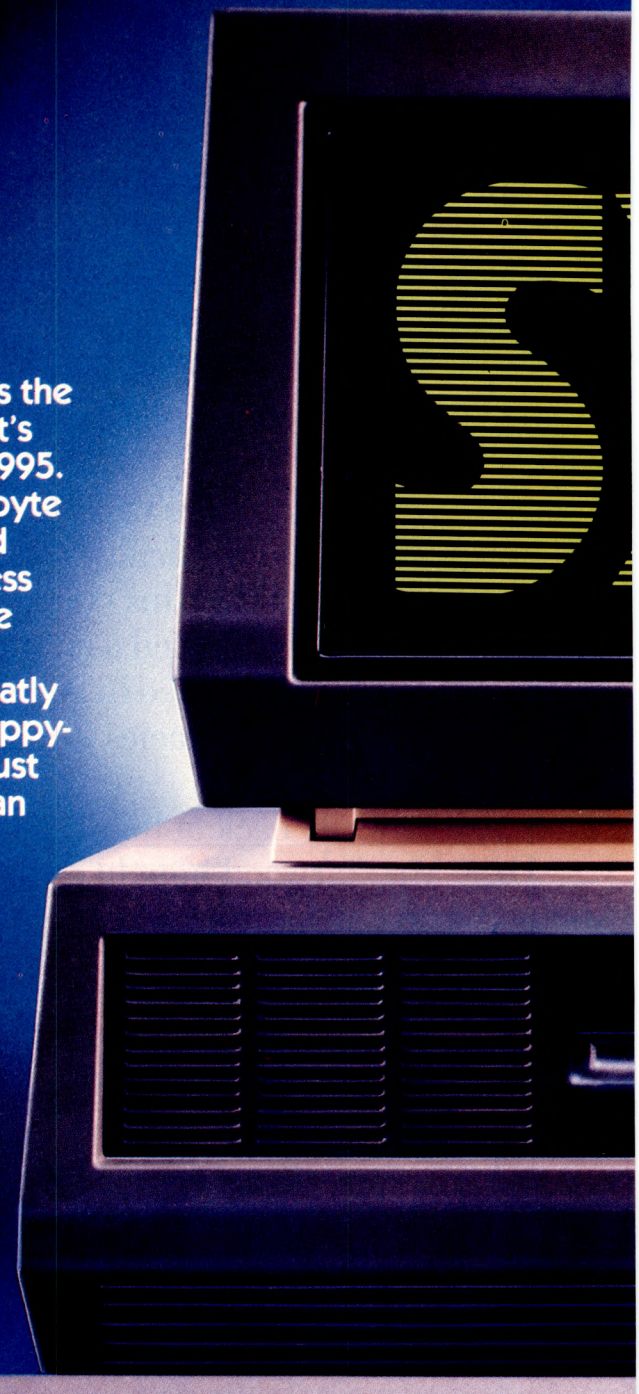
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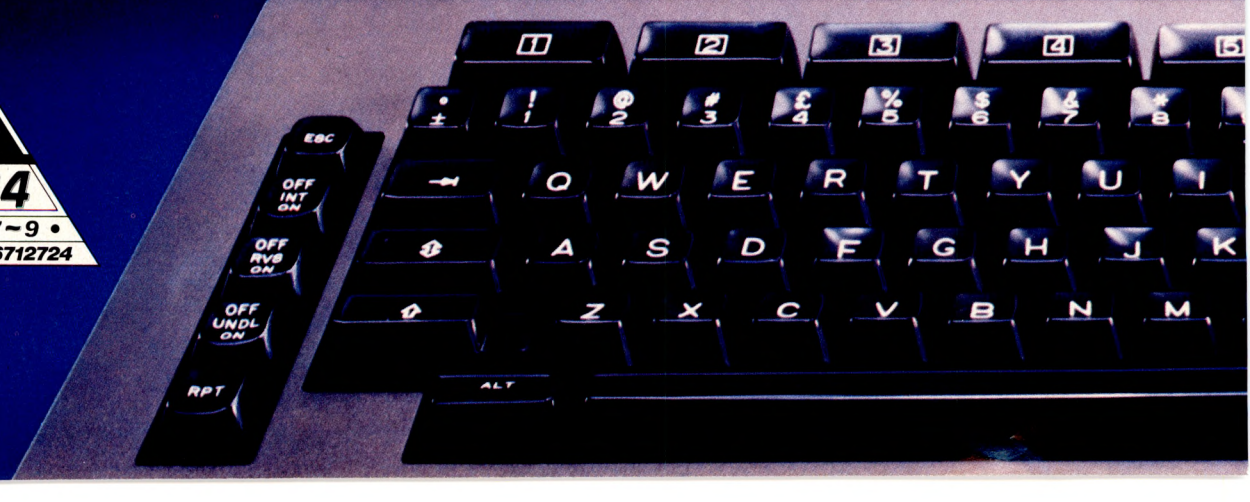
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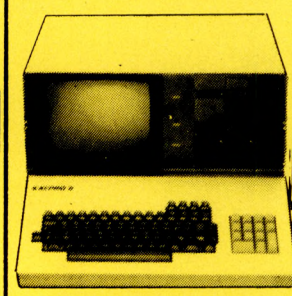
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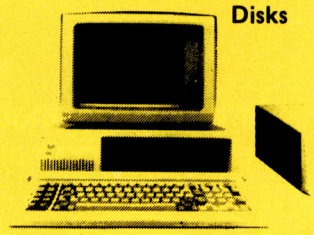
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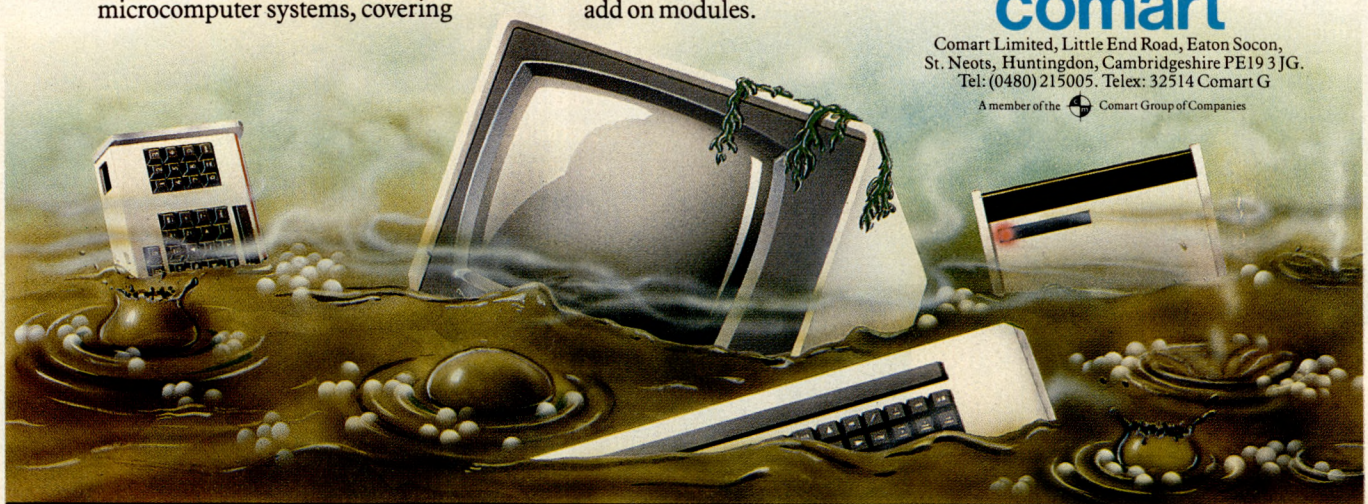
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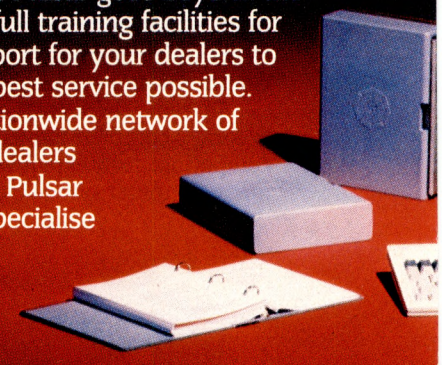
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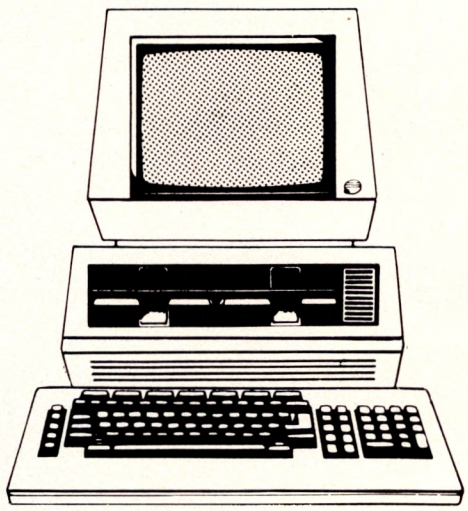
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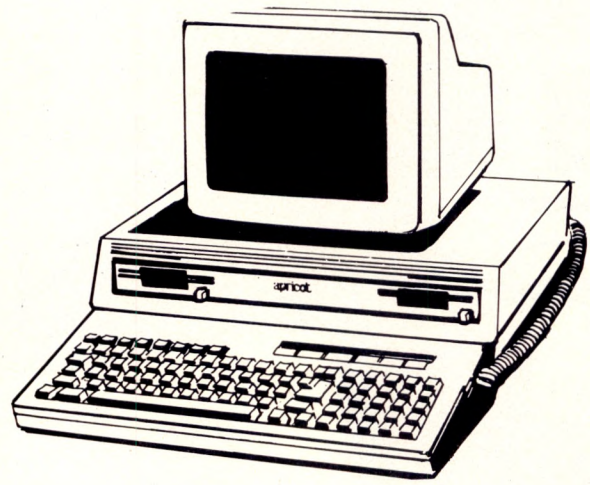


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BENCHTEST

Xerox 16/8

Although Rank Xerox stands at the forefront of technological achievement, it is often slow to put its ideas into practice. Its latest machine, the 16/8, boasts two processors which means it can perform two tasks concurrently. Peter Bright was first in line to see the machine.

Rank Xerox is a strange company — it has the reputation of being full of good ideas which it then does nothing with. For instance, years ago it invented a very good local area network called Ethernet, then left it to drift around before picking it up again. Ethernet now looks set to become the industry standard local area network. Xerox also invented the mouse and combined it with icons and screen windowing to create the Star executive workstation. Apple Computers then came along, took the idea (and the engineers) from Xerox and developed the Lisa system.

Xerox's latest offering in the personal computer market, the 16/8, is a development of the 820 series of Xerox micros.

But, before you stop reading this article with the time-honoured cry of 'Xerox-Boring' read on, because the 16/8 has some interesting tricks up its sleeve.

The most interesting feature of the 16/8 is that it has two processors which can run totally independently of each other. So what you get in effect is two micros in one box. This means that it is possible to have two different programs running at the same time.

Xerox is also keeping up with the times by including a mouse with the 16/8 so there is no need to be envious of Lisa owners any more. Now you too can have a mouse (and the complete system will only cost you £1961).

Hardware

At first sight the Xerox looks much like the C/WP Cortex (Benchtested in December '83). Instead of the usual configuration — processor box, disks, monitor and keyboard — the processor is packaged with the monitor and the disks come in a separate box. The advantage of incorporating the processor in the monitor box is that it takes up less desk space.

Unpacking the machine and setting it up was very easy; it was simply necessary to plug in the disk drives and the keyboard, switch on and go.

The main unit and disk drives come in the standard off-white pre-formed plastic.

All the I/O ports for the processor are located on the rear of the main box. The connectors are the 'D' socket type and consist of the following: disk port, keyboard port and two RS232 serial interfaces, one for the printer and one for communications — no Centronics printer port is provided.

Inside

Getting inside the 16/8 is very easy: all that's needed is to remove two screws and lift off the top cover. Once this has been removed all the main components can be reached.

The 16/8 contains two processors — a Zilog Z80A running at 4MHz and an Intel 8086 running at 4.77MHz. In simple terms the 16/8 is Xerox's old 820 II with the addition of an 8086 card. The main PCB lies flat at the bottom of the casing below the VDU tube. The board is well made and contains the Z80 processor along with all the TTL logic needed to run the machine. The board also contains two expansion slots, one of which is used for the 8086 processor card. Interestingly, this card is not made by Xerox but by Vector International in Belgium. The card is very well made with sockets being used for all the chips.

Usually, if a micro has two processors it uses one for the main processing and one to handle the I/O. The 16/8 is unusual in that each processor can act independently of the other. Each processor has its own RAM and can get on



The keyboard is well laid out and has a lot of 'give' in it

Photography by John Mason



The Xerox is a variation on the traditional three-box theme

with one task while the other does something totally different. This ability allows two applications programs to run concurrently. I'll cover this in more depth in the 'Systems software' section below.

The total memory available on the entry level 16/8 comes to 192k. This is divided up into 64k for the Z80 and 128k for the 8086. Memory on the 8086 can be further expanded to 256k on board by piggy-backing the extra RAM onto the 8086 card. There is also 8k of ROM which contains the Host Terminal and Typewriter programs (see below) and the bootstrap CP/M loader.

In use, the machine is very quiet. This is partly due to the fact that it does not use a fan for cooling. Instead it uses convection cooling so that all the heat can rise away from the electronics and escape through vents in the top of the main casing. The machine can be reset either by pressing the reset button located on the back of the main processor box or by pressing the control and escape keys at the same time.

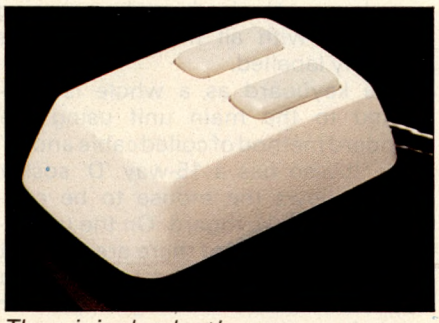
Disks

The 16/8 can support either 5¼in or 8in floppy disks as well as a hard disk. The review machine came with twin double-sided, double-density 5¼in drives giving 400k of storage per drive. The other 5¼in drive option is single-sided giving 140k per drive. Xerox can also supply single and double-sided 8in drives and a 10 megabyte 8in hard disk. In use the disk drives were very quiet but also got quite hot.

Expansion

By the time you read this article, Xerox should be able to supply either 5 or 10 slot expansion boxes. These will sit under the display making the machine look more like a conventional three box micro.

I was disappointed that Xerox could not supply an expansion box with the review machine. The reason for this was that it did supply a high resolution graphics board which meant that every time I wanted to use the high-res board I had to open up the machine, take out



The original rodent!

the 8086 card and plug in the high-res card. Quite a performance just to get pretty pictures on the screen!

Apart from high-res, Xerox will also be able to supply a number of other cards, such as extra RAM and an Ethernet link.

With regard to the Ethernet link, it should be possible to set up some very powerful networked systems using the 16/8. I am told that part of the reason for the separate processors is to allow for networking using the Z80 as a dedicated network processor.

Keyboard

Instead of using its old 820 keyboard, Xerox has designed a new low profile version. This contains a total of 97 keys divided up into five functional areas. The left-most area contains the qwerty typewriter keys complete with a small LED in the shift lock key so that you can tell when the keyboard is locked in upper case.

To the right of the qwerty section is the cursor control section. This is set out in an odd manner with west, south and east side by side, and north set above this line. The cursor control section also provides a 'home' key which moves the cursor to the top left of the screen.

Above the cursor control section is a group of four keys marked 'Accept', 'Delete', 'Prev' and 'Next'. These keys are used by application programs in much the same way as the other function keys. Different key-tops are supplied for different functions.

To the right of these keys is the numeric keypad. The middle key has a small bump on top of it so that touch typists can find it easily.

Nineteen function keys run along the top of the keyboard. They are broken down into three groups of four, one a group of two and one single key. On my keyboard these keys were labelled F1 to F12 plus one blank key, one labelled 'undo' and one labelled 'help'. I couldn't make the help key do anything useful. The keyboard supplied with the review machine was a USA spec, non-word processing keyboard. Xerox can also supply a customised word processing keyboard with all the function keys properly labelled.

The keyboard as a whole is connected to the main unit using the standard method of coiled cable and 'D' plug. It also has a 15-way 'D' socket which allows the mouse to be connected to the keyboard. On the underside of the keyboard there are two feet which can be extended to allow the keyboard to be tilted to give a better angle for typing.

When I started to use the keyboard, I thought it had a 'dead' feel to it. Also there's quite a lot of give in the base supporting the keys so that if you press a key hard the whole keyboard moves. One thing that annoyed me was that none of the keys autorepeat. I can't understand why Xerox has done this — It must be possible to configure the system to autorepeat because one of the system disks supplied allowed the 'E' key to autorepeat.

Mouse

The review machine was supplied with a 'mouse'. If you have been on a desert island for the last year and don't know what computer mice are, then read on. If you know about mice you had better skip the next section.

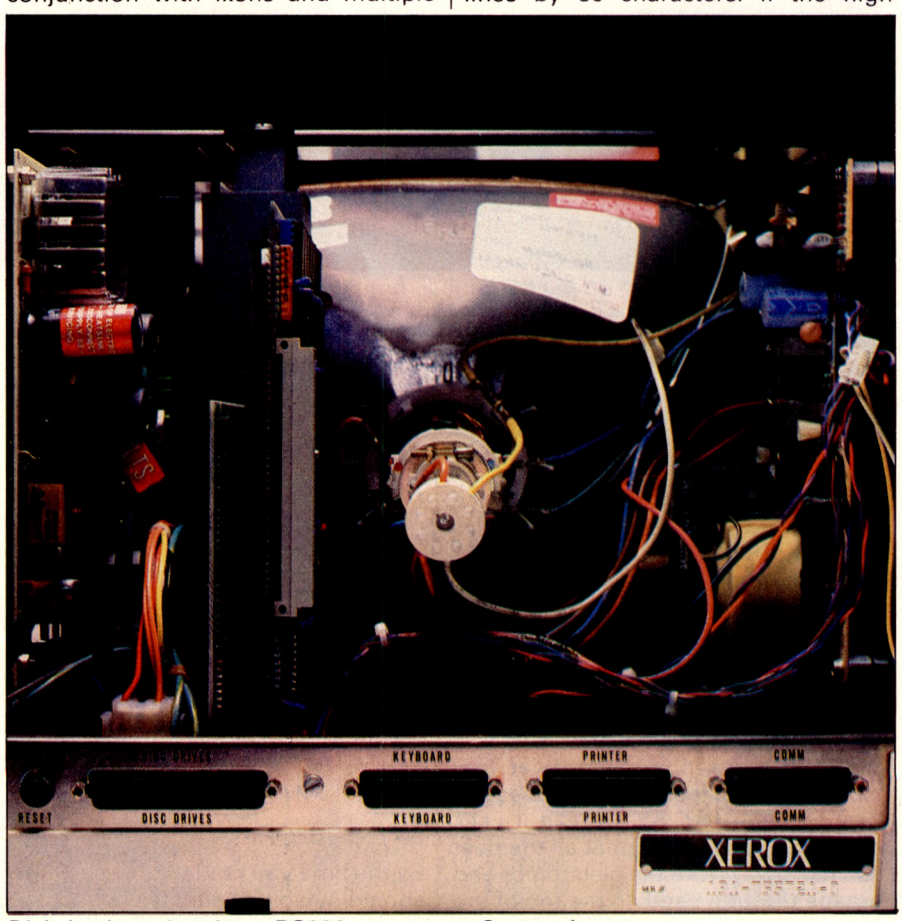
The Mouse was invented by Xerox for its Star executive workstation. The idea behind the mouse is that people don't like using keyboards. Traditionally the average executive is unable to type and so Xerox came up with a small hand-held device which could be used to control the cursor on the screen. A mouse also has either one, two or three buttons on its back which can be used to control machine operations. On the Star workstation the mouse is used in conjunction with ikons and multiple windows to create an advanced integrated system.

The mouse supplied with the 16/8 is the same one that's used with the Star workstation. It has two buttons on its back — the left one returns a control N and the right one returns a control O. On the underside of the mouse there are three ball bearings arranged in a triangle. The top bearing is used to register which direction the mouse is being moved in. Players of Missile Command will know how this trackball arrangement works.

Screen

I liked the screen. When you look at it the first thing you notice is a large black lump of plastic in the front of the main casing. This is in fact a polaroid anti-glare filter which works by the ingenious method of twisting rays of light through 90 degrees. This filter does work, the only drawback being that it cuts down the brightness of the screen making it difficult to read in some circumstances. It is sometimes necessary to turn the brightness up: the brightness control is a sliding bar located on the underside of the main casing at the front.

The display itself is the standard 24 lines by 80 characters. If the high



Disk, keyboard and two RS232 ports — no Centronics

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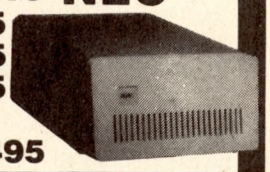


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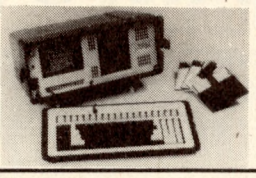
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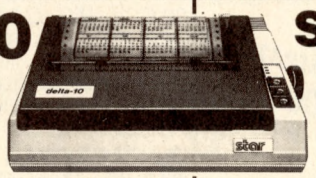


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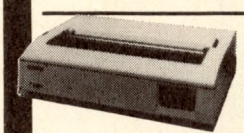
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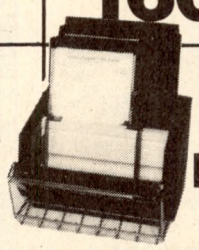
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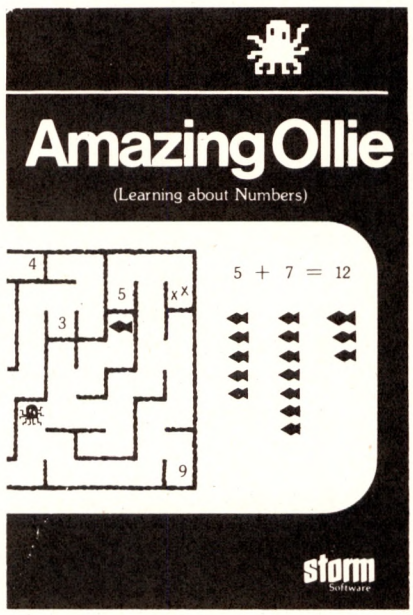
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resolution board is used the screen has a resolution of up to 642 x 250 pixels which allows high quality displays to be created.

My main dislikes about the screen were that it is apparently not possible to adjust the contrast.

Systems software

When you first switch the machine on, you are greeted with a screen asking you to choose one of three options. These are: L(oad System), H(ost Terminal), T(ypewriter). Of these, Host Terminal and Typewriter are ROM-based programs and Load System calls the disk operating system.

The Host Terminal program is very useful if you want to use your 16/8 to act as a terminal to a mainframe as well as a stand-alone micro.

As this program is ROM-based there is no need to go to the trouble of loading CP/M — all that's needed is to switch on the machine and call the program from the sign-on menu. The program uses the RS232 comms port in full duplex mode running at 300 baud. All the data displayed on the screen is saved in RAM in CP/M's Transient Program Area (TPA) and can be saved to disk later using CP/M's SAVE command.

I tried this utility out briefly on Prestel using an acoustic coupler plugged into the RS232 port. It seemed to work very well.

The Typewriter option can be used if you need to type out a quick letter. This mode does not have any text editing as such — it simply echoes what you type on the screen to the printer. I spent quite a long time trying to make this work with the Epson MX80 supplied with the machine, all to no avail. It is possible that this was due to a fault in the program, but it is more likely that the vagaries of RS232 protocols were to blame.

The 16/8 supports three disk operating systems — CP/M-80, CP/M-86 and MS-DOS version 2. Xerox has customised CP/M-80 and CP/M-86 so that if a disk error occurs you are not presented with the dreaded BDOS ERROR ON A message. In Xerox's version of CP/M disk errors occur gracefully with an A(ccept), I(gnore), R(etry) message. My copy of CP/M had a nasty bug in it because every time I changed a disk in drive A, the drive set itself to Read Only (as it should) but refused to allow itself to be reset or control C'ed. This had the effect of turning file copying into an exercise in ingenuity trying to convince the drive that it wasn't Read Only.

When the machine is first switched on and the L(oad System) option selected, the machine loads up CP/M-80. It is then necessary to load CP/M-86 by typing "LOAD 86". As soon as both operating systems have been loaded it is possible to switch between the two by typing control backspace to get from 80 to 86 and control return to get from 86 to 80. This means you could load up CP/M-86, call WordStar, tell it to print a document, switch back to CP/M-80, and then load a spreadsheet and work on that while the WordStar document is still printing.

This ability to perform more than one task at the same time is known as 'concurrency'. At the moment the main way of achieving concurrency is by using Concurrent CP/M. This allows up to four different tasks to be carried out at the same time. The difference is that Concurrent CP/M works by telling one processor to spend a short time on each task in turn; on the 16/8 each task is carried out on its own processor. In effect you have two micros in one box.

The use of concurrency on the 16/8 does raise a few problems though. One of the most useful features of concurrency is the ability to carry out 'print spooling'. This means that you can print out a file while you get on with doing something else. This is not always possible on the 16/8 for the following reason. Say that you have just finished a document on WordStar running under CP/M-86 and you want to print it out and get on with another document. You tell WordStar to print the document, switch to CP/M-80 and try to call WordStar again. It won't work because your version of WordStar was designed for a 16-bit processor. The only way out of this is to buy two copies of WordStar — one 16-bit version and one 8-bit version — not a very satisfactory arrangement. However, even if you don't use the concurrency, you still have a machine that can run both 8- and 16-bit software which means that a far greater variety of software is available.

If you decide that you would prefer to run MS-DOS version 2 rather than CP/M-80/86 you will not be able to use the concurrency features of the 16/8. Actually loading MS-DOS is quite a performance. First you have to load the MS-DOS boot disk, then you have to load the MS-DOS systems disk, then you have to load the applications program. If you haven't got the message that it might be a better idea to stick with CP/M by the time you've gone through this a few times, then you never will.

Disk utilities

Xerox has supplied the usual set of disk utilities. The only problem as far as the review machine was concerned was that some of these utilities seemed to have random error generators built into them! To be fair to Xerox it did supply new versions of the offending programs, but I still didn't trust some of them.

'With regard to the Ethernet link, it should be possible to set up some very powerful networked systems using the 16/8 . . . part of the reason for the ZX0 processors is to allow for networking using the Z80 as a dedicated network processor.'

INIT is the disk formatting utility. When called, it asks which disk you want to format and then asks whether the disk is single-sided single-density, single-sided double-density, double-sided single-density or double-sided double-density. In theory once you have done this, the program should go on and format the disk. What happened in practice was that it crashed out proclaiming that the drive door was open. Once it had got this out of its system it then happily formatted the disk on the second time of asking.

SYSGEN is used to transfer the system tracks to a new disk. SYSGEN can only be used if CP/M-86 has not been loaded. If CP/M-86 is present the program will tell you you should reboot in CP/M-80 stand-alone mode. Other than that SYSGEN works fine. If you want to copy the whole disk you will need to use COPY. This is to be avoided if at all possible as it is very slow. Then again I suppose it is better to be slow but sure . . .

Configur

CONFIGUR allows you to change some of the system parameters and either

Benchmarks

BM1	1.2
BM2	3.6
BM3	7.4
BM4	7.7
BM5	8.7
BM6	16.0
BM7	4.7
BM8	24.7

All timings in seconds. For a listing of the Benchmark programs see 'Direct Access'.

save the changes to disk or temporarily activate your changes. The latter option is very useful if you are not quite sure what the result of your changes will be — you can temporarily activate the changes without changing the system tracks on the disks. All the options are presented in menu format. Changes can be made by using the cursor keys to move the cursor to the desired option and then by using the space bar to scroll through the different settings. Using CONFIGUR you can do the following:

Record restart command. This allows you to specify a program which will be called every time the system is booted up. I suspect that the most common use for this option will be to issue the "LOAD 86" command needed to call CP/M-86.

Select printer port/comms port options. With this you can set the baud rate, parity, XOn/XOff, etc, on the printer port and the communications port. A point to remember here is that if you are using the machine as a host terminal with the ROM-based terminal emulation program, you will not be able to set the word length, parity, etc. The reason for this is obvious — CONFIGUR is a CP/M utility and CP/M won't be present if you are using ROM-based software.

Select I/O device assignments. This has the same effect as the CP/M's STAT DEV: but is much easier to use.

Select floppy disk head step rate. This allows you to vary the speed at which the floppy disk read/write head moves across the disk. I can't imagine why you would want to do this. (All ideas on the back of a five pound note, etc.)

You can also use CONFIGUR to set the screen attributes (Highlight/low-light, blinking, etc,) and to set the keyboard data format (7- or 8-bit).

Applications software

Xerox supplied a number of applications programs with the review machine including two word processing packages — WordStar and Xerox's own 823 word processor.

Old faithful WordStar managed to eat half of one of my articles — which didn't exactly make for a happy afternoon. I was just about to condemn the machine for being unreliable when another machine in the office managed to eat an entire Benchtest that a certain Home Computing Editor had just finished writing! This has led me to believe that we must have had some surges on the office power supply that particular afternoon.

The version of the 823 word processor has been modified by Xerox to work with the mouse and was supplied to demonstrate that the mouse does actually work. This program is menu-driven, so you can use the mouse to move the cursor around and choose from menus. The mouse implementation was fine as far as it went but the program would need more modification to integrate the mouse fully. Having said that, Xerox did point out that the program was not intended for serious use and is still being developed.

Apart from the word processors Xerox also supplied a graphics package known as Grafox. Grafox is designed to work with the 16/8's high resolution graphics hardware and runs under CP/M-80 on the Z80 processor. Using Grafox you can create Pie Charts, Bar Charts and Line Graphs using either data that has been entered manually or data from a wide range of spreadsheets and databases. I tried this out using data that I had created in a Supercalc model and it worked just fine. Where Grafox differs from some other graphics packages is in its ability to create graphs and charts by applying formulae to existing data.

Grafox supports a wide range of maths functions such as SIN,COS,TAN, LOG, etc, which can be used to create some very sophisticated displays. This is not the place to give a detailed description of this package — suffice it to say that it is a very powerful package.

The only programming language supplied with the machine was Microsoft's Basic-86 running under MS-DOS. A look at the Benchmarks will show that the 16/8 compares well with other 16-bit micros being neither the fastest nor the slowest we have tested.

Documentation

The 16/8 was supplied with no less than eight user manuals of which three claimed they were the user guide. In fact, of these three one was the reference guide, one was the operator's guide for machines with 8in drives and one was the operator's guide for the hard disk system.

All the Xerox manuals were very well packaged in cloth-covered, loose-leaf binders and boxes. All the text was photocopied (well, what do you expect from a company that makes photocopiers?). The user guides were well laid out with much use being made of diagrams and cartoons. The reference guide contained everything I wanted to know but the information was not always where you would expect to find it and, although there was a list of contents, there wasn't an index, so finding things was a bit difficult.

Of the other manuals, two were for MS-DOS — one reference guide and one user guide, two for Multiplan and one for Grafox.

Prices

An entry level 16/8 can be purchased for £1961 plus VAT. This is very competitive with other 16-bit machines on the market. The review machine complete with twin, double-sided, double-density disk drives costs £2174 plus VAT. If you decide you need the expansion box, it will cost an extra £400.

Conclusions

When this machine first arrived in the office I didn't think that I was going to like it. The systems software was giving me trouble and after it ate half of one of my articles I didn't trust it. I have now changed my mind. Bear in mind that the review machine was a very early production model which decided to have a few teething troubles while I was using it. Xerox put the systems software right and I had no more problems.

The big feature of the 16/8 is obviously its concurrent processing. However, I am not sure how useful this will be in practice. The trouble is that it does not support useful features such as print spooling. This means, for example, that if you want to spool a WordStar printout, you will need two copies of WordStar — one 8-bit version and one 16-bit version. Having said that, if, for example, you are upgrading from an 8-bit system and can transfer your files, this machine could provide a useful upgrade path — the Z80 processor could be very useful as a dedicated network processor in a local area network. Even if you don't use the Z80 processor, the 16/8 is very competitive with other 16-bit machines on the market and is worth looking at. END

Technical specification

CPU	Z80A running at 4MHz and 8086 running at 4.77MHz
RAM	192k split into 64k for Z80 and 128k for 8086
ROM	8k
Display	24 lines × 80 chars
Keyboard	97 keys plus mouse
Disks	Either 5.25 or 8in floppies or 8in hard disk
I/O	Two × RS232 (one comms, one printer), keyboard, disk
Software	CP/M 80-86, MS-DOS

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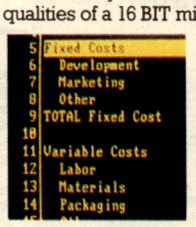
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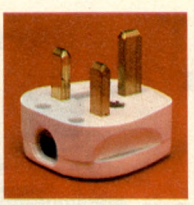
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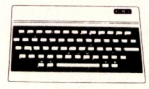


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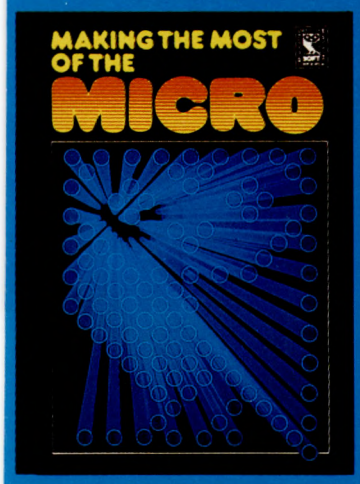
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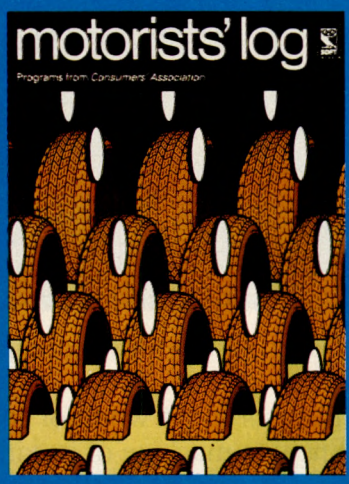
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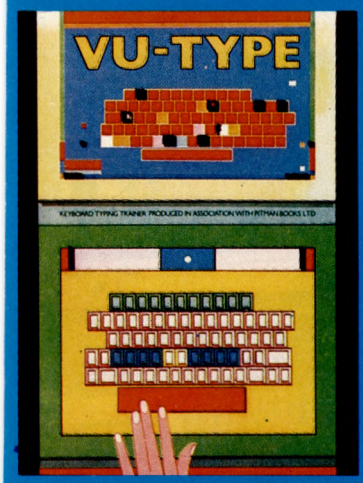
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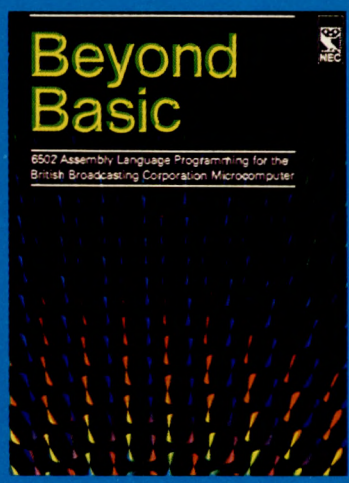


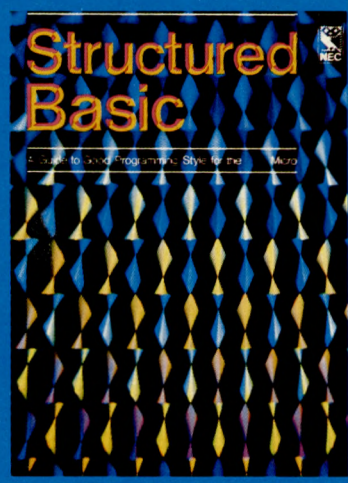


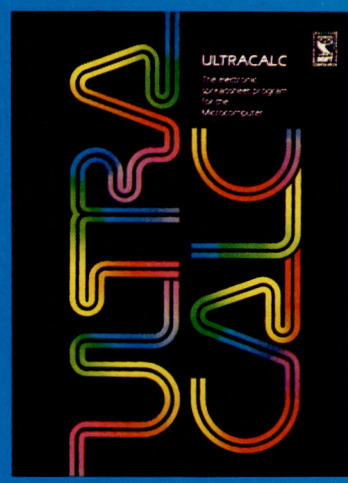












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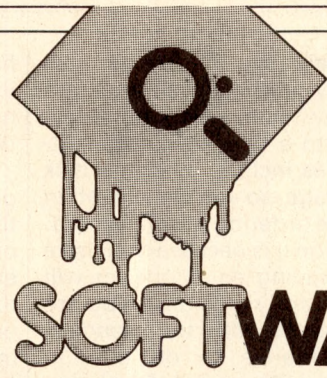
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TK! Solver

Has Software Arts come up with another successful formula in the shape of TK! Solver? Mike Liardet examines this unique equation-solving system from the inventors of VisiCalc.

Software Arts' new baby originated in the brain of Milos Konopasek, a textile engineer. Way back in the sixties he devised a suite of programs for solving complex textile equations. In 1980, he approached VisiCalc author, Dan Bricklin, with his idea. And now, after a massive re-programming effort by the Software Arts team, TK!Solver has arrived. 'TK' by the way stands for 'tool-kit' and the '!' is the system's most important keystroke.

TK!Solver is, as VisiCalc was four years ago, a highly original and unique product. Essentially it is the world's first commercially available equation-solving system. Now if you have not looked at a mathematical equation since you were thrown out of your Maths 'O' level class, don't worry; Software Arts has made things as easy as possible for you. Along with TK!Solver it is making available a number of 'solver-packs' where the equations are already set up and all the hard work has already been done. Software Arts is aiming to produce a variety of these packs for different application areas, but it already has four available: Financial Management, Mechanical Engineering (both included with my review system), Building Design and Introduction to Science.

TK!Solver is only the second product in five years from Software Arts. Its first effort was the world-famous VisiCalc—the system that invented spreadsheet software. For TK!Solver, Software Arts has dropped its arrangement with Visicorp, the publishers of VisiCalc, and is publishing it itself, with some involvement from McGraw-Hill which is involved in publishing the solver-packs. In the UK, TK!Solver is being distributed by Marketing Micro Software Ltd.

What Does It Do?

It should be obvious by now that TK!Solver is definitely not a run-of-the-mill spreadsheet system. Basically it is an equation-solving system. You type in a series of equations, key in the values for some of the variables, then press the action key ('!') to work out the values of the other variables.

With conventional spreadsheet systems you have to decide before you start which aspects of the model are going to be input, and which will be output. For example, if you were using a spreadsheet on a mortgage calculation, you might use it to calculate (ie, output) repayments, given the input of the amount borrowed, and interest rates, etc. Although you may not realise it, you are actually using equations as the basis for the model. However, if you subsequently wish to know how much you can borrow for a specific repayment, you would then need to set up a completely different model, where repayments are an input not an output. Nonetheless, this model is based on the very same equations, and *you* would have to solve them manually, before you could even set up the new model.

With TK!Solver, you just specify the equations once, and then freely change your mind about which variables are input and which output. With TK! Solver you can put the cart before the horse. So once the mortgage equations are set up you can readily answer questions like: how much could I borrow at a repayment of £50 per month? What repayment period would keep repayments down to £60 per month? What will happen if interest rates fall.

Of course there are many other facilities in TK!Solver that would do credit to any spreadsheet package — for example, graph plotting, extensive 'help' messages, and automatic unit

Spreadsheets—a guide for beginners

Spreadsheet software is useful to anyone who regularly uses a calculator.

The VDU screen acts like a 'window' on a large 'sheet' of numbers—neatly laid out rows and columns, occasionally interspersed with text headings.

By using a few quickly learned keystrokes it is possible to shift the VDU window to the desired point of interest. It is possible to enter text, a number or a 'formula' which can, if required, be a complex calculation referring to several other positions on the sheet. The result of the calculation is displayed immediately with automatic recalculations throughout. Frequently an alteration on the top line of a spreadsheet can change everything from top to bottom in just two or three seconds—an exercise that would take several hours by hand!

Each month, the 'Which Spreadsheet?' series analyses and tests a different spreadsheet system. Further information for beginners can be found in the spreadsheet articles in the PCW *February and December 1983 issues.*

conversion (eg, imperial to metric, pounds to dollars).

Getting started

My review copy of TK!Solver was for the IBM PC. Currently, in the US at least, there are other versions available for the DEC Rainbow, Apple IIe, and Wang machines running MS-DOS. Between them, these versions encompass two different processors and four different operating systems, which speaks volumes for the versatility of Software Arts internal developmental language 'IL' (short for 'implementation language'). Software Arts is planning further versions, but don't be surprised if CP/M is not one of them. Quite simply, the limited 64k of RAM in CP/M systems causes all sorts of problems for software packing this amount of sophistication.

To run TK!Solver on a PC, at least 96k of RAM and one disk drive must be present. To get the best out of it, however, a less minimal system would be advised, in particular an 80-column display, printer and more RAM.

Having let my PC knowledge get a little rusty of late, I was particularly well placed to check out whether the introductory information to TK!Solver on the PC was up to scratch. The documentation included a short booklet with clear concise instructions for getting started and solving a first simple problem. Thus it is possible to solve your first equation literally five minutes after you start — a great confidence boost!

TK!Solver Scorecard
Easy to learn: !!! (excellent)
Easy to use: !! (good)
Robustness/
Error handling: !!! (excellent)
Facilities: !!! (excellent)

S Rule

```
rconsum = distanc/petrol
speed = distanc/time
cost = petrol * price
rconsum = (speed * (200-2 *
speed))/125
```

Fig 1 Printout of rules-sheet for petrol consumption model

As this was a special PC version there was no need to go through a 'VDU-installation' procedure. The software was already primed with all the PC peculiarities. The booklet seems to anticipate every silly thing you might do — for example, confuse the letter 'l' with the digit '1' — explains special keys on the keyboard and is well-illustrated, with pictures of how to insert disks and so on.

Unfortunately the TK!Solver program is copy-protected, so you are unable to copy it onto a working disk or transfer it onto a hard-disk, etc. Software Arts does include a backup disk with the package, so you are not left in the lurch while ordering a replacement.

Fairly early on it is necessary to use a data disk for 'saving' equations you will be setting up, and regrettably you are forced to wrestle with the standard PC-DOS commands to do this. In comparison, the PC version of the Lotus 1-2-3 spreadsheet system (and Software Arts' very own Apple VisiCalc for that matter) does all the formatting and copying for you, simply under menu control. Nevertheless the TK!Solver manual does contain clear instructions on how to go about this.

'To run TK! Solver you simply type 'TK' in response to the PC-DOS prompt, give the copyright screen a quick glance and then you immediately enter the world of automated equation solving.'

Solving TK-style!

To run TK!Solver you simply type 'TK' in response to the PC-DOS prompt, give the copyright screen a quick glance and then you immediately enter the world of automated equation-solving.

This world is organised as eight 'sheets', used to hold all the information about the equations and other related matters. At any given moment any two of these sheets can be visible on the VDU screen, or alternatively the whole display can be given over to just one sheet. The familiar 'windowing' principle is used to organise the display, with the current 'action point' denoted by a cursor. With a more complicated model, some sheets may grow bigger than the display space allocated to them. Attempts to move the cursor (using the arrow keys) out of the bounds of the display result in a rapid redraw to accommodate the destination point of the cursor — all very familiar to spreadsheet users. Although most of the sheets can grow as long as necessary, they all have a fixed width, and fixed column headings, so there is no need for them to grow horizontally, as a spreadsheet does.

To get started with TK!Solver it is only necessary to work with just two of the sheets, and these are the two sheets on display when the system is first entered: the rule-sheet is used to store the equations and the variable-sheet is used for information on all the variables in the equations. As the equations are keyed in the variable names are automatically entered on the variable-sheet. You can enter as many equations as you like, limited only by the amount of memory available in the machine, but, in practice, quite complex models can be set up with just 10-20 equations.

As an example, consider the simple petrol consumption model in Figs 1 and 2. This model has four equations and seven variables. Suppose we are about to embark on a 300-mile motorway journey, and we are concerned to get there quickly, but not so quickly that we consume a huge amount of petrol. The first three equations simply define what we mean by rate of consumption, speed and total-cost and the fourth equation specifies how petrol consumption and speed are related. In this instance the minimum rate of consumption is 40mpg at 50mph, decreasing to a ludicrous level as the speed falls to 0mph or rises to 100mph. Clearly this equation is a gross approximation of the way petrol consumption corresponds to speed, but if we had the real figures available then TK!Solver would provide a mechanism whereby you could actually set up a 'user function'. This would exactly model the tabulated performance characteristics of the car.

In Fig 2 three variables have been given input values (300 miles for distance, 10 hours journey time and £1.80 per gallon for petrol), and the

St Input	Name	Output	Unit	Comment
	rconsum	33.6		rate of petrol consumption
300	distanc			distance travelled
	petrol	8.9285714		petrol consumed
	speed	30		average speed
10	time			time taken
	cost	16.071429		cost of journey
1.8	price			price per unit of petrol

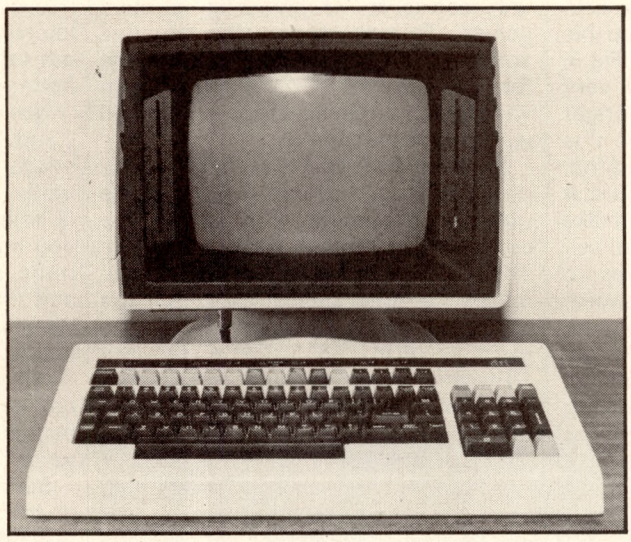
Fig 2 Printout of variable-sheet for petrol consumption model

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remaining output values have been calculated by TK!Solver: nearly nine gallons of petrol, costing just over £16.

Now suppose we decide that we may be prepared to spend more, say, £18, and are wondering what difference this will make to the journey time. In Fig 3, TK!Solver has been given this very problem. Notice that 'time' is no longer an input, but 'cost' is instead. In this instance TK!Solver has calculated that the journey will take just four hours at 75mph. Well that's how long it will take if we don't get pulled up by the police!

Although this last printout gives no indication of the fact, the answers were obtained by using 'iterative' solving. The answers in the previous printout were obtained by 'direct' solving. TK!Solver always tries direct solving first, and if this works the answers 'tumble out' almost immediately. But not all equations will succumb to this method. Failing direct solution, TK!Solver resorts to its powerful iterative solver. To get started the iterative solver must be fed with a guess value for one or more of the unknown variables. In this instance the speed was guessed as 50mph.

Iterative solving takes longer than direct solving, and in the worst cases may fail altogether. It is possible to control the number of iterations before TK!Solver gives up, and of course the better the initial guess, the better the chance of reaching a solution. In the example given, TK!Solver's standard 10 iterations were not sufficient to solve the problem when the initial speed guess was 0mph. During iterative solving TK!Solver displays an iteration count together with an estimate of the number of iterations it will need. However, there seems to be no way of interrupting the iterative solver if you get fed up waiting and want to try a better guess.

Notice that two of the columns in Figs 2 and 3 are blank. The 'St' column is for status information — for example, if a value is a guess—and the 'Unit' column is where the units can be specified. If you intend working with a mixture of units, say, metric and imperial or feet and inches, then you must specify what's what in the units column, and also use a third sheet — the units sheet — to indicate how one unit can be converted to another (for example, '12 inches = 1 foot', '1 metre = 1.094 yards').

So far we have mentioned just three of the nine sheets in TK!Solver. The remaining six are:

★ **Global sheet.** This sheet is used to set up various system parameters, like the maximum iterations allowed, paper width and other miscellaneous details.

★ **List sheet.** Instead of a variable being assigned a single value it can be assigned a list of values, so that a sequence of solutions can be generated.

The list-sheet lists any variable which has a list of values, then for each variable there is a sub-sheet which contains the actual sequence of values.

★ **User function sheet.** There are instances when two or more variables are related in some way, but the relationship cannot be stated in a normal equation. User functions can be employed in these situations. For example, a motoring magazine may publish a table giving a car's petrol consumption at various speeds and, using TK!Solver's user function sheet, this table can be set up to model accurately the car's performance in this respect.

★ **Plot sheet.** Several lists of values (from the list sheet) can be plotted on the screen or printer. The plot sheet is used to specify which lists are to be used and how the graph is to be annotated.

TK!Solver does not use high resolution graphics facilities for its plots (see Fig 4). It builds up the image using normal text characters like '+', '!' and '–'. This means that TK!Solver requires no special graphics hardware, which is obviously an advantage, but the final result is not very pretty, and of course cannot be as accurate as a high-resolution plot.

★ **Table sheet.** As an alternative to graph plotting, TK!Solver can generate

St	Input	Name	Output	Unit	Comment
		rconsum	30		rate of petrol consumption
	300	distanc			distance travelled
		petrol	10		petrol consumed
		speed	75		average speed
		time	4		time taken
	18	cost			cost of journey
	1.8	price			price per unit of petrol

Fig 3 Printout of variable-sheet for petrol consumption with 'cost' as input instead of time.

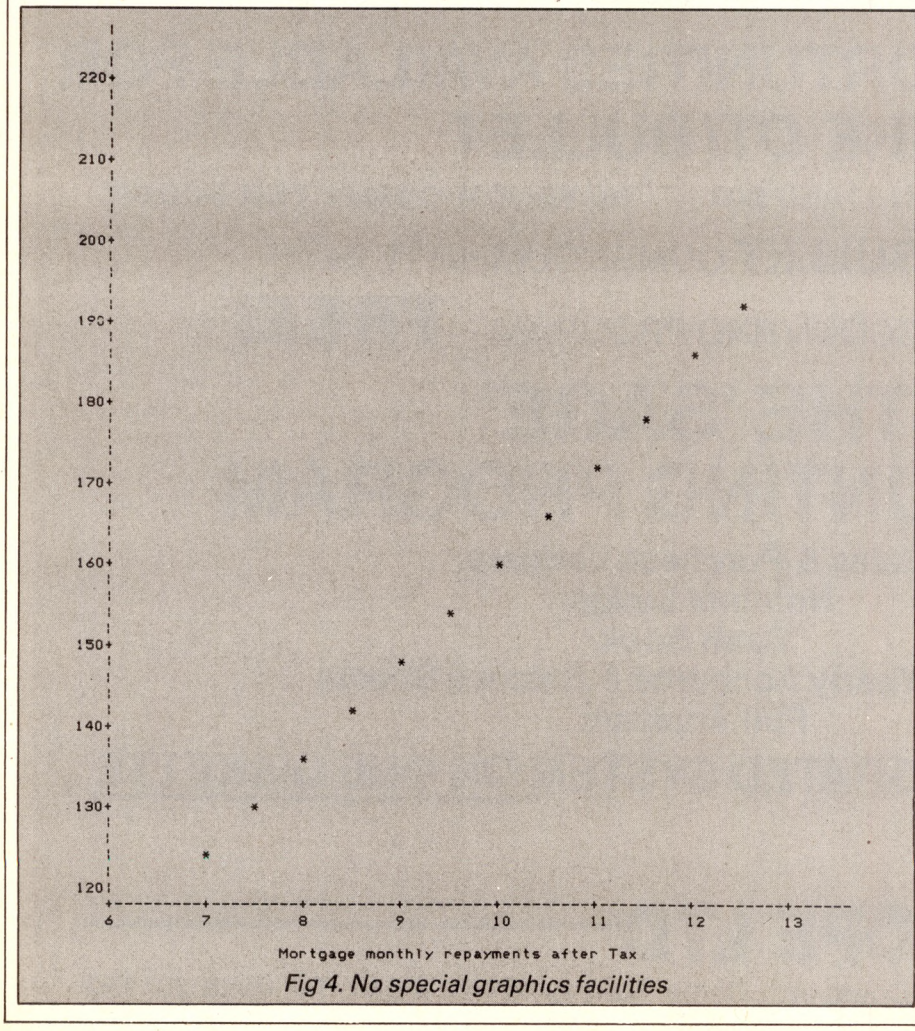


Fig 4. No special graphics facilities



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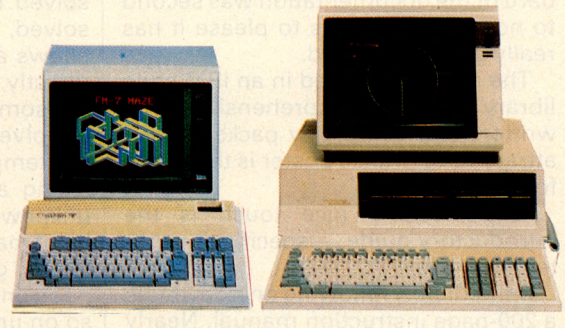
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formatted reports. The information needed for each report — that is, lists to be reported on with column widths, and so on, is contained within the table sheet.

Solver-Packs

Software Arts has anticipated that a number of potential TK!Solver purchasers will not have the time, inclination or ability to set up the equations to model their particular problem area. The solver-packs have been introduced specifically for their benefit.

Each pack is targeted at a specific application area, and is supplied as a disk and well-presented spiral-bound manual. When using a solver-pack you can safely ignore the rule and unit sheets and concentrate primarily on the variable sheet.

You can use any of the models by simply setting up your chosen input values for the variables and then getting it to solve the equations to get the answers.

Specifically, the financial management solver-pack contains 13 different models ranging from compound interest, through 'leverage' to bond analyses, and so on. There are 126 pages in the manual, and the presentation is of the same high standard as the TK!Solver manual proper.

One minor irritation is that all monetary units use the '$' symbol. It would not be too difficult to change this to our own pound-sign, but it is a pity that Software Arts has not done this already for the UK market.

Documentation

Since TK!Solver was Software Arts' first venture in publishing, the company was especially anxious to ensure that the overall presentation and standard of the documentation was second to none. In its efforts to please it has really gone overboard.

The manual, housed in an IBM-style library box, is comprehensive, well written, and beautifully packaged. An attractive reference poster is thrown in for good measure.

A particularly nice touch is the introductory guide — specifically written for the IBM PC.

Immediately following on from this is a 200-page instruction manual. Nearly every other page shows a picture of the screen, and this manual takes you, tutorial fashion, through nearly every facility in the system.

Bringing up the rear, there is a massive reference manual outlining every last detail of the system. Software Arts did not forget the index, so it is very easy to find your way around everything.

And if all that is not enough documentation for you, the program itself provides extensive on-line help screens.

How it works

Software Arts is fairly confident that TK!Solver will not be so extensively plagiarised as VisiCalc has been. Although VisiCalc is an extremely clever piece of software, a competent systems programmer will have a fairly clear idea of the internal workings of it once the user has seen it. This is definitely not the case with TK!Solver. So, a discussion of how TK!Solver works can only be fairly superficial.

The solving process always starts with an attempt at direct solution. An equation can be solved directly if, among other things, only one variable is unknown and that variable occurs only once. Thus if b & c are known (already solved or given input values), then the following equation can be solved directly as follows:

b * c + a^2 + max(b,10) = min(c,5)
a^2+ max(b,10) = min(c,5) − b * c
a^2 = min(c,5) − b * c − max(b,10)
a = sqrt (min(c,5) − b * c − max(b,10))

Talking of square roots, TK!Solver will not perform complex arithmetic, and can only work with real numbers.

A surprisingly large number of systems of equations succumb to the direct solver, which generally works quite quickly. In many instances there may be just one equation which can be solved directly, but once it has been solved, the newly solved variable allows another equation to be solved directly, and so on.

If some or all of the equations cannot be solved directly then iterative solving is attempted. Iterative solving works by taking an initial guess value for the unknown variable(s), then applying a bit of mathematical magic to produce a 'better' guess. If the 'better' guess is not good enough then it iterates again, and so on until either it hits the nail on the head or is forced to give up because it has exceeded the maximum permitted number of iterations. Note that the iterative solver needs to be fed an initial guess before it can start. This guess must be keyed into the variable sheet by the user. If it is a good guess then the solution process will be faster. Also some systems of equation can have more than one solution, and the initial guess will determine which solution is found.

Finally, if all else fails the TK!Solver manual gives some advice on what to do. Principally this amounts to rewriting one or more of the equations into a form with which it can work more easily. TK!Solver is happier with expressions like x^2 than x * x, and sometimes it helps if an equation is entered redundantly in some equivalent but different form. Obviously, the maximum permitted number of iterations can be increased, but this means longer waits. It is also possible to adjust the comparison tolerance — so that if two successive guesses differ by less than this the equations are deemed solved.

Conclusions

TK!Solver has no direct competition. If you need a general purpose equation solver, and especially if your field of application is covered by the solver-packs, then you must have it.

Although there are no rival general purpose equation-solvers to TK!Solver, there are special purpose ones available — in the shape of linear programming software, like Caxton Software's Optimiser. In addition to their prime function of optimising resources, linear programming systems can solve sets of linear equations, but without the need for initial guesses that TK!Solver demands. However, LP systems cannot handle non-linear equations. (Examples: '3 * x + 5 * y = 7' is a linear equation, but '3 * x * y = 4' and '3 * x^2 = 12' are not.)

However, what if you are not sure whether you need equation-solving, or whether some other modelling package might not suffice? Well, you might put TK!Solver alongside spreadsheet software like 1-2-3 or VisiCalc for that matter — all three are excellent in their own way and available on the IBM PC. But, undoubtedly, most users would find the spreadsheet systems easier to get to grips with.

Finally, will Software Arts break all records again? Well, TK!Solver is certainly innovatory and with huge potential. But I can't help thinking that it is going to have to work a lot harder to convince the masses of its real worth.

END

'Specifically, the financial management solver-pack contains 13 different models ranging from compound interest, through 'leverage' to bond analyses.'

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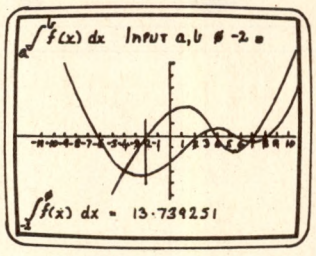
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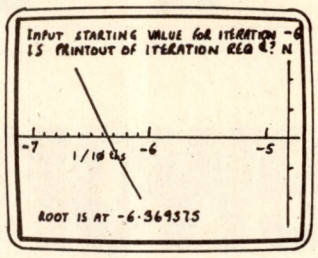
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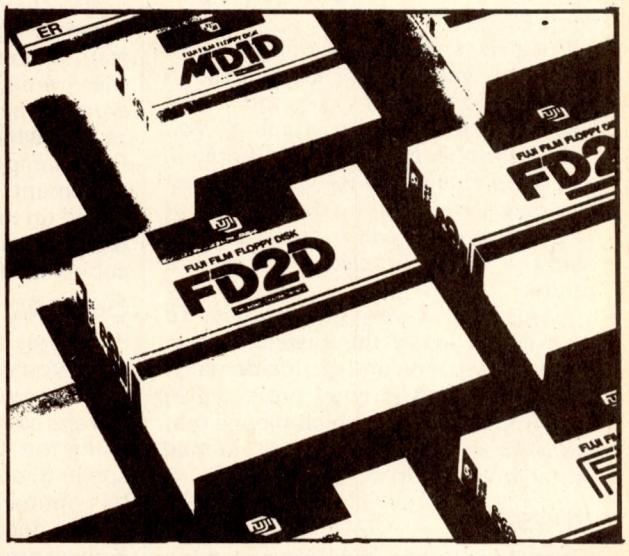
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Homeword

Peter Bright looks at a friendly and inexpensive word processing package for the Apple II which is unconventional in that it uses icons.

If you have a home micro you may well be looking around for something useful to do with your machine. One idea is home accounts — I tried that out last month (see 'Good Housekeeping' January *PCW*). Another is word processing — I wasn't planning to tackle this area for a while and then a package turned up on my desk which looked too good to be true.

Homeword is a word processing package that runs on the Apple II range of micros. It differs from other word processors on home micros in that it uses icons, which make it very simple to use while retaining powerful commands. Up until now icons have only been used on expensive business machines like Apple's Lisa (see review, *PCW*, July 1983). This package only costs £39.95!

But all is not lost if you don't have an Apple II — versions are expected soon for the Commodore 64 and Atari. According to the instructions all you need to run Homeword is an Apple II, II+, or IIe plus 64k of RAM and at least one disk drive. You could add a printer to that list — there isn't much point in using a word processor without a printer!

Homeword is very easy to use. To start it you insert the system disk in drive A, switch on and go. Incidentally, the system disk is copy protected in best Apple tradition which means that you can't make a back-up, so you had better look after it.

In use

When you start to use Homeword the first thing you see is the screen split into two halves. The top half is where you type your document and the bottom half has six little pictures — a printer, a piece of paper, a filing cabinet, two pieces of paper, a strange looking semi-circle, and a computer disk. These are the icons which are used to issue commands (see below). If you want to get into the typing area it is necessary to press the ESCape key. This gets rid of the icons and lets you get on with typing your document. If you want to get back into command mode, you just press the ESCape key again, and you will be back with the icons.

Icons

The program makes extensive use of icons to make it easier to use. In this case they take the form of pictures of filing cabinets, pieces of paper, disks, and so on, to represent different functions. They are selected by using the cursor control keys to move a 'picture frame' over the different icons. When the frame is around the icon you want to select, you press the return button which then calls that function. For example, if you want to call up a document that you have previously saved on the disk you would move the picture frame to the picture of the filing cabinet and hit the return key.

Setting up

If you are using the package for the first time, you will need to tell the program about the way your Apple is set up. This is very easy to do and is achieved by using the 'Customize' (note American spelling) option. The icon representing this option looks very like one of those old art deco lift indicators — the ones with an arrow that point to the floor the lift is on. Using the Customize option you can change the default values for line spacing, margins, and so on, as well as inform the program how many disk drives you have (it assumes you only have one) and which type of printer card you are using. Once you have entered these settings you can save them to disk and never need to look at the Customize option again.

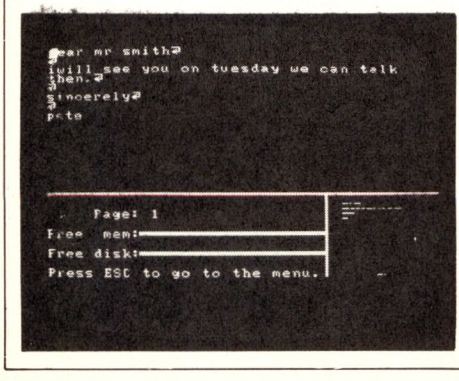
The typing area

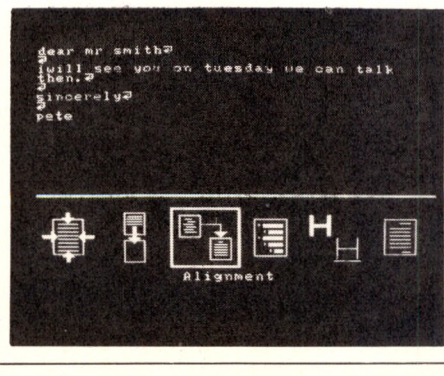
Once you have entered the typing area (by pressing the ESCape key) the screen is split into three sections. The top two thirds is the main typing area which can display 16 lines × 40 characters of text. The lower third is split in two. The left-hand side shows the page number, the amount of free memory and the amount of free disk space. The free memory and free disk values are represented by horizontal lines which get shorter as you use up memory.

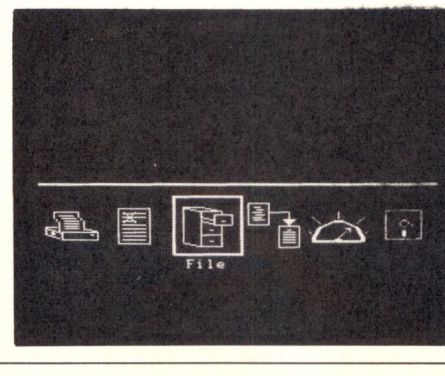
The right-hand side shows a small picture of the page of text on which you are currently working. This is one of the nicest features of this package. The picture shows a visual representation of the complete 60 character × 80 line page as it will be printed out. This is helpful because the main typing area only shows the words you've typed; it doesn't show how the text will be displayed when it is printed out.

The keyboard

Anyone who has ever used an Apple II or II+ keyboard will know it's not ideal for word processing. One of the major problems is that many Apple keyboards don't support both upper and lower case letters so, although the keyboard has a SHIFT key for capitals, it doesn't do anything useful. Homeword gets around this problem by using CTRL S to produce capital letters. If







C♦H♦E♦C♦K♦O♦U♦T

'If you are using the package for the first time, you will need to tell the program about the way your Apple is set up. This is very easy to do and is achieved by using the "Customize" option.'

CTRL S is pressed once the next letter you type will be converted to a capital. Pressing CTRL S twice has the same effect as CAPS LOCK. Other fun things about the Apple keyboard are that it doesn't have a delete key (CTRL D), or a cursor up key (CTRL Z or J), or a cursor down key (CTRL A or K). All this means that if you are used to a normal keyboard it may take some time to get used to the Apple keyboard. To be fair, all these problems are Apple's fault and Homeword's authors have done their best to get around the problems by providing an easy-to-read card showing all the necessary control codes.

When you are entering text the program defaults to insert mode. This means that if you go back over a piece of text and type in some other words, the original text will be pushed aside to make way for the new. The alternative to this is to switch to replace mode (CTRL C) which will allow you to type over the original text. Another feature supported by Homeword is automatic word-wrap. This means that when you get to the end of a line you can carry on typing and the program will automatically move split words to the next line. Using this, the only time you'll need to use the RETURN key is to start new paragraphs or to insert spaces into the text.

Filing

When you have finished your letter you will want to save it to disk. The exact method of saving to disk will vary according to whether you have one or two disk drives. I was using two drives: drive 1 was used for the program disk and drive 2 for the document disk. If you only have one drive you'll have to swap disks in and out.

Saving a letter is simply a matter of selecting the 'file' option (the icon looks like a filing cabinet). You are then greeted by four more icons — save file, get file, insert document and include document. The first two are self-explanatory. Insert document and include document allow you to combine different files to make up a new file. For example, you could have ten or twenty standard paragraphs which could be combined in different ways to make up personalised letters.

Editing

Homeword provides some powerful features to allow you to alter text in a document. The editing function is represented by an icon showing a piece of paper with some words crossed out. Using the editing tools it is possible to mark out blocks of text and then move, copy or erase those blocks. A nice feature is that it is possible to reconstitute erased text so even if you accidentally erase some text all may not be lost. Using edit it is also possible to find a word in the text and replace it with another word. The icon to do this is a magnifying glass which is quite apt.

For playing around with the text, Homeword provides some more powerful tools to alter the layout of your document. Using the layout option you can set up headers and footers, change the typestyle to bold or underlined, change the line spacing, etc.

Printing

When you have finished laying out the letter you may not be quite sure how it will look once printed out. This is because the only indication of how your printed document will look is the miniature picture of the page which is displayed on the text entry screen. This is very small and could be prone to errors. To get over this problem Homeword allows you to print the letter to the screen so that you can correct any layout problems without wasting printer paper. This means that you should only have to use the printer once to provide the final copy — no excuse for naff print-outs!

Criticisms

I have very few criticisms of this product. In general all errors are very well trapped with a bleep from the machine and a helpful message appearing on the screen. As the program makes such heavy use of icons which only use the cursor and return keys to issue commands, it is very difficult to make command error.

The maximum number of pages the machine can hold at any one time is about seven or eight pages of solid text. If you want more pages it is simple to save the document in parts and join it back together when it is printed (using the include document option). When the program does run out of memory it can sometimes lock up solid. This can be a problem but you get plenty of warning because the memory indicator line will become very short.

More disturbing is the fact that it would sometimes produce random errors for no apparent reason. In my case, its favourite trick was to drop into command mode when I was typing text. This was not too serious because I could just hit the ESCape key and carry on typing but it did once crash totally which is rather worrying.

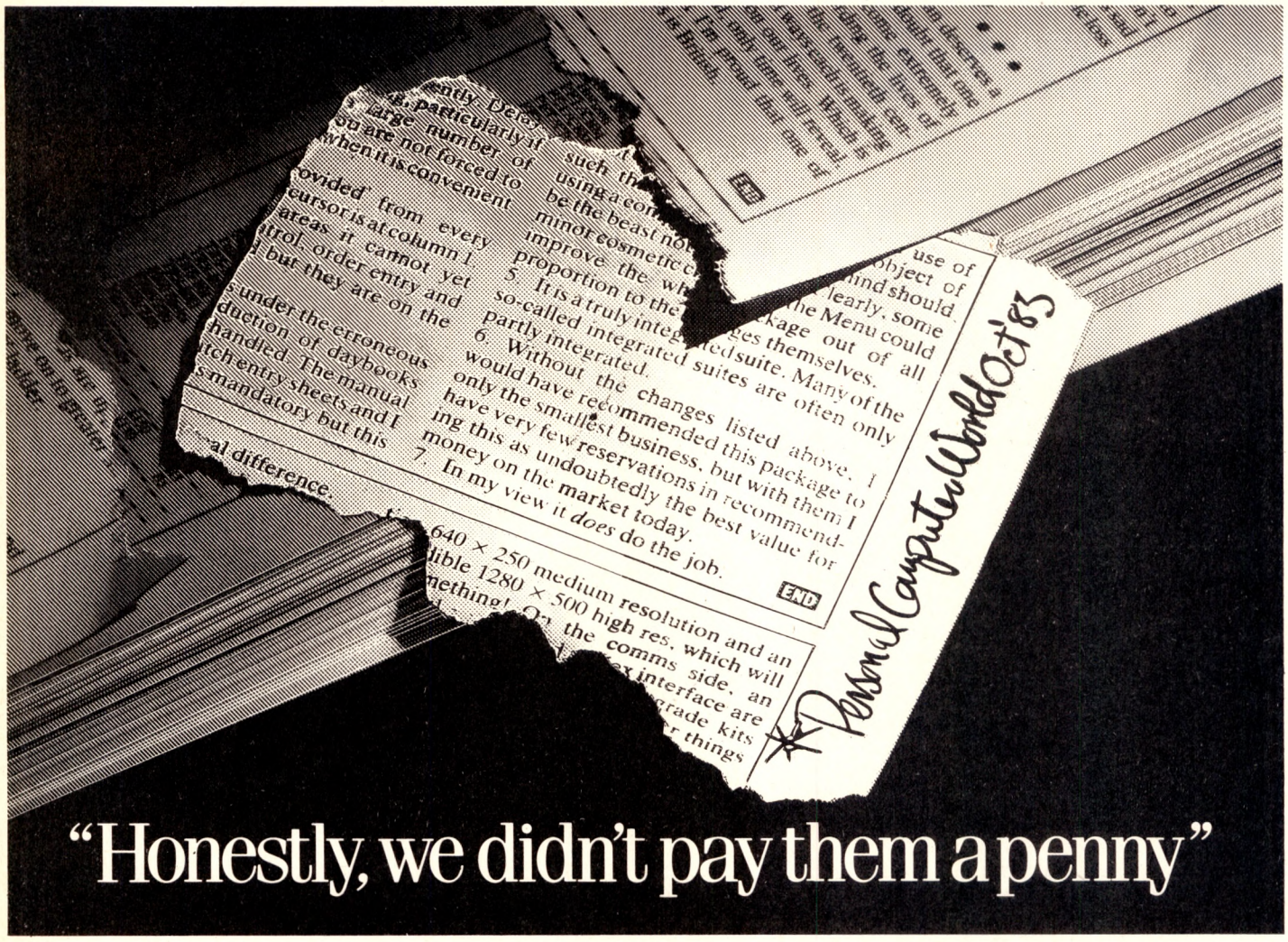
Documentation

The documentation is very good indeed. The main instructions for use were contained on a cassette tape in the form of a tutorial taking you through the features. In case you don't have a tape recorder a transcript of the tape is also included. The reference manual is called *The Homeword Story* and lists all the commands along with a short troubleshooting guide which contains such gems as 'If you have no picture on the screen . . . make sure that your monitor's on/off switch is "on".' The manual is also embellished with cartoons featuring a cat leaping across the pages — I'm not quite sure how this helps you learn but it's entertaining.

Conclusions

I was very impressed with this program — it's certainly the best value piece of software that I've seen this year. For £39.95 you get Lisa-like user friendliness, icons and, above all, a package with which you can actually do something useful. The chief problem I can see at the moment is that it only runs on the Apple. This won't be a problem for long because versions are planned for the Commodore 64 and the Atari. I think Homeword will be even better on these machines because they have better keyboards than the Apple. Even so, if you have an Apple and need a word processor, take a close look at this one.

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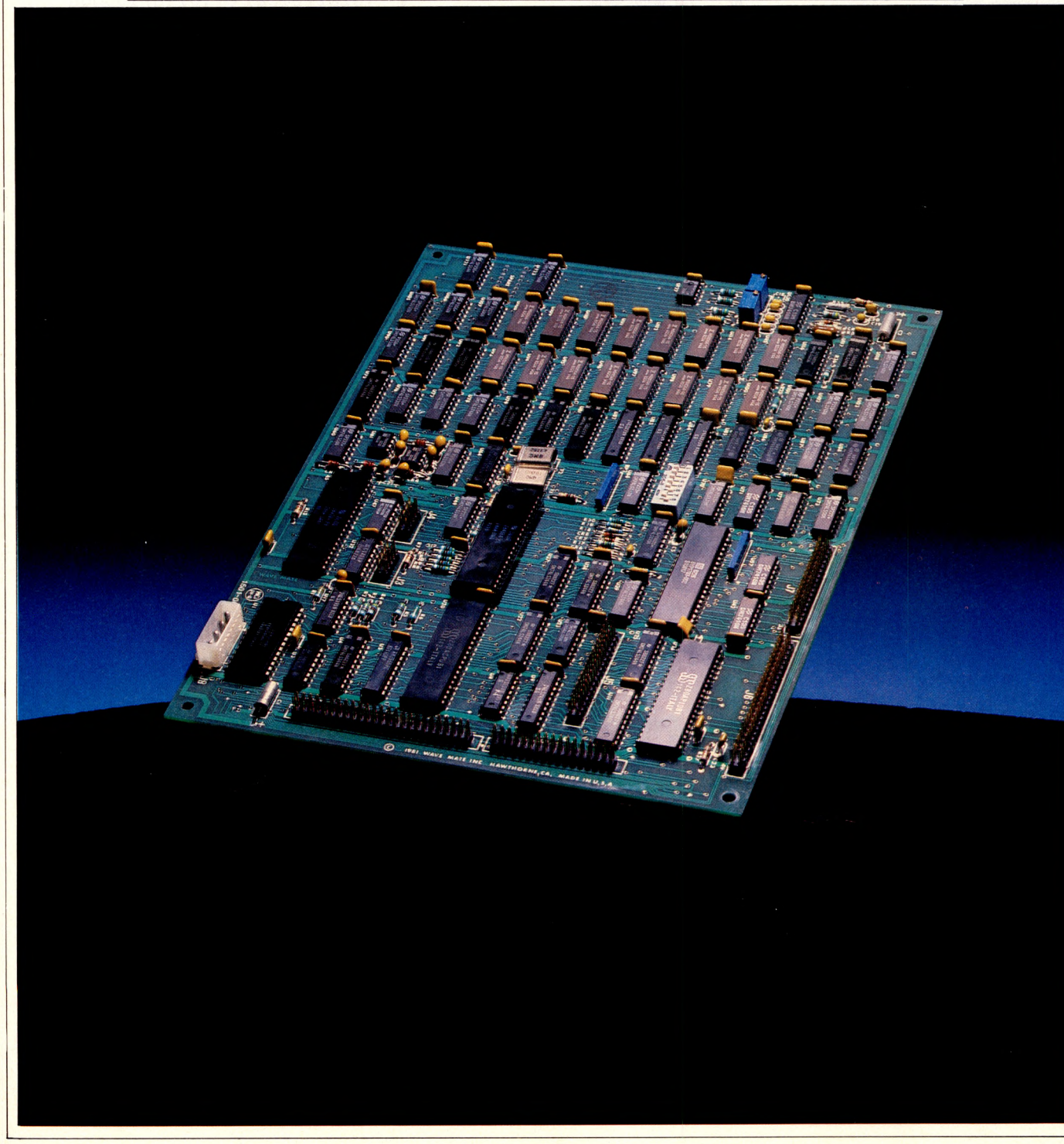
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Bullet

'Customised computing' has hit the UK in the form of the Bullet from the American company, Wave Mate. Already successfully launched in Belgium and Holland, this Z80-based, single-board computer can be built to any price and design specification. Tony Hetherington reports exclusively from Holland.



Photographs by John Mason

The Bullet micro is a Z80-based, single-board computer which can be housed with a selection of disk drives in a box of any design. In essence it offers customised computing. The disk drives can be selected from a choice of 3½, 5¼ and 8in floppies and 5, 10 and 15Mbytes winchester drives. The housing can be of your own design and ranges from a system built into a desk to a go-anywhere portable.

The Bullet helps to dispel the 'black box' image of computers by presenting the customer with a circuit board around which his system is built.

A typical system with screen, Bullet board, twin 5¼in drives and the new CP/M Plus operating system costs a reasonable £1500.

The Bullet is manufactured by an American company called Wave Mate but is distributed outside the US by appointed agents. Manorex, a small Dutch company based in Soesterberg, is the agent distributing the Bullet in Holland and neighbouring Belguim.

In Holland, the Bullet is being used by the CP/M users' group as its standard demonstration system and also by Utrecht University for both scientific and administrative applications.

Manorex is now implementing plans to bring this flexible system to the UK.

Hardware

The Bullet's facility of providing the user with customised computing may solve many problems for users but it does cause a few for a reviewer. There is no set system to be examined and so the usual hardware headings of 'monitor' and 'keyboard' are inappropriate. There is also little point in detailed descriptions of the specific machine reviewed since the user has free choice of terminal and can change it if unsuitable. So this review is restricted to the features of the Bullet that will be common to all systems along with a few examples of some systems I have seen.

Bullet Board

The Bullet Board is a single-board computer of about A4 size (204×272×15mm) and forms the heart of every Bullet system. In fact it is the only piece of hardware that is found in all Bullets.

Approximately a third of the board is occupied by the army of RAM chips required to form the 128k of onboard memory. The rest of the available space is dominated by the five forty-pin chips. These include the Z80, a processor running at 4MHz, a DMA to move data around memory and a floppy disk controller. There is also a P10 (parallel input/output controller) which provides two parallel ports which are utilised as centronics and winchester interfaces and a Dual Asynchronous Receiver/Transmitter ('DART') which provides two independent serial ports.

The DMA is essential in the Bullet because it manages the onboard memory and allows the Z80 processor to access it all, even though this is double the Z80's normal limit.It does this by employing a technique known as memory banking. In this the memory is divided into two banks of 64k which are then paged in as required. The paging is performed by the DMA and is transparent to the user. It gives the effect of a machine with 128k.

Fig 1 shows the banked memory organisation of the Bullet and, as you can see, there is an area of memory which is common to both banks. This is the area set aside for the resident part of the operating system (CP/M) and hardware-dependent data such as disk directories. The rest of the operating system resides in the bank which is currently paged into the system and is copied over when the banks are switched. At first sight this may seem wasteful of memory but it does in fact leave about 60k of TPA (Transient Program Area) for your programs to run in, which is ample for most applications.

The floppy disk drive controller allows the use of all standard disk drives including the new 3½in ones. This, combined with the winchester interface in the DART, makes a truly impressive array of devices available (3½, 5¼ and 8in floppies and 5, 10 and 15Mbytes hard disk).



The Visa: one of many compatible terminals for the Bullet

Variations on a theme

'Tell us what you want and we'll build it' is the philosophy behind the version of the Bullet which I saw. It was on a stand at an electronics equipment show held near Amsterdam and at the time I could do little more than confirm that it did actually work. It consisted of a Bullet board and twin 3½in drives which were housed in a case complete with a built-in screen. The case was of the usual transportable, as opposed to hand-held type, but was only a prototype. This was still quite impressive because only 24 hours before the show opened this Bullet was apparently a pile of components with a telephone request for it to be built.

A transition from portable to quite definitely stationary is necessary to move to the next Bullet. This was built into a desk unit where I stayed put during my visit to Holland. The desk was coloured in a pleasing mixture of cream and brown and featured a shelf with a built-in light making for a very pleasant working environment. The Bullet and its disk drives occupied the space normally taken up by the desk's drawers and the system was completed by a desk-top Geveke Visa terminal. This is the system used by Manorex for its own software development and it has an incredible range of disk drives, two each of floppy drive type and 10Mbyte hard disk.

BENCHTEST

A system like this costing about £5000 is beyond the needs and/or price range of many potential users — one reason why a slightly more humble model was used for the review.

The model in question

The review machine comprised a Visa terminal and a blue box housing a Bullet board and two 5¼in disk drives. The box is made of steel with blue side and top panels and two sturdy handles on the front. This gives it an industrial appearance, but is only one of a varied selection of housings available. The Benchtest shows photographs of some of the other more photogenic models but this one was judged to be the one most likely to survive in the *PCW* office.

The back panel houses all the Bullet's connections to the outside world and consists of two RS232 interfaces and one centronics. One of the RS232 interfaces is used to connect the Bullet to the terminal and will work with any terminal where there is a consistent baud rate. To aid this, both serial ports can be set to operate at a number of baud rates ranging from 75 to 76,800. The Visa terminal definitely wouldn't have been my choice as it is not very compatible with the Bullet. The Visa's main claim to fame is its range of switchable baud rates and specialised function keys. However, neither of these were used by the Bullet and you are left with irritating omisions from the keyboard such as the pound sign.

The disk drives are manufactured by NEC and proved to be the noisiest part of the system, but since the box unit can be comfortably sited under a desk this isn't really a problem. I think that they sound louder than they actually are because the Bullet has no background fan noise to drown the noise out. The Bullet uses power switching which does away with the need for an internal transformer — the normal fount of unwanted heat — so a fan is no longer required. The drives are of the pleasant turnlock variety with large red LEDs indicating when a drive is in use. The box hardware is completed by a reset button and two switches to select the necessary disk to boot the system.

Systems software

Without an operating system a computer is little more than a lifeless collection of silica, metal and plastic. So it is important that a computer manufacturer selects a system that will complement the hardware and push it to its limits. The Bullet offers a choice of two systems, CP/M 2.2 and CP/M Plus which are covered in detail below.

CP/M 2.2

The presence of CP/M 2.2 on the Bullet is very traditional and basically cosmetic. Since it is available on so many other machines the manufacturer feels obliged to support it. But it is highly unlikely that anyone will actually use CP/M 2.2 since it doesn't support the use of banked memory and therefore wastes half of the Bullet's RAM. Historically CP/M 2.2 was introduced on the Bullet to support the then new generation of 5¼in disks — the previous version was unable to cope with the varieties of formats and densities. Once cheaper memory made banked memory economically viable there was a need for a version of CP/M to support it, and so CP/M Plus appeared on the scene.

CP/M Plus

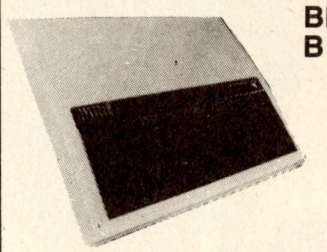
CP/M Plus is the banked version of CP/M 3.0 and, as mentioned above, was written to keep CP/M compatible with current hardware developments. However, while including the facility of memory banking Digital Research took the opportunity to rewrite and improve on the existing CP/M commands. The memory banking system is the major addition as it supports up to sixteen banks of 64k. Each of these banks can be paged in and out as required, thus dramatically improving the memory capacity of a Z80 system.

Disk access has also been significantly improved by the introduction of



The Bullet board can be housed together with a variety of disk drives in any box

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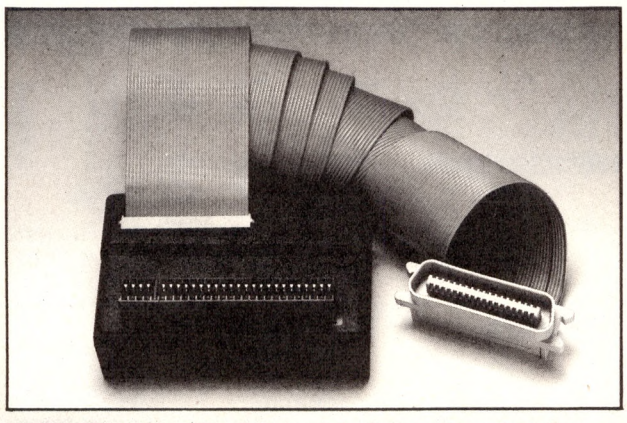
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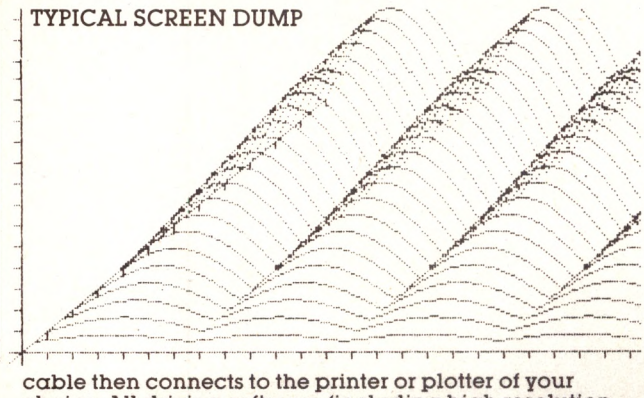
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a hashing technique to find the physical location of the relevant file on disk. This information was previously stored in the disk directory and involved a comparatively time-consuming search through the list until the required one was found. Using the hashed disk access each file, when created, is allocated a numerical value which is stored in the directory until needed. The value is inserted in the hashing function (or equation) which produces as its result the physical position of the data on the disk, thereby removing the search process.

Incidentally, in its advertising material, Manorex uses the results of Benchmark tests which it claims demonstrate that the Bullet is faster than the IBM PC and Sirius, which are from the supposedly superior group of 16-bit machines. However, these tests, particularly the ones assessing disk reading and writing, are a test of the operating system and not of the hardware. I would suggest that such tests prove the theory that it's not the number of bits you've got that matters but how you use them.

CP/M Plus supports up to sixteen separate disk drives and also provides an auto recognition facility. This is useful since it means you don't have to enter a CONTROL C command whenever a disk is changed. And not only does it recognise a new disk but will suspend any file I/0 for files on the disk that have been replaced.

A disk can be subdivided into 16 sections, each identified by a user number, so introducing a crude form of file protection. This is enhanced by passwords, and the security system is completed by the setting of disk and drive attributes. Both have a default value of R/W or 'Read' and 'Write' but can be set to Read Only (R/O). Thus you can prevent a user from accessing files, changing specified files or altering any files at all.

These attributes are changed using the SET command which is the first of the enhanced commands.

'Show' is an improved version of the old DIR command and gives detailed information about the disk drives and their contents. This includes the drives' capacity, the number of directory entries and a breakdown of the information held in those directories.

Some attempt has been made to make CP/M Plus a user-friendly system by the inclusion of the 'Help' and 'Submit' commands. With Submit it is possible to simulate a batch-processing system, since it is used to create a submit file of commands which can then be run in order by the execution of a single command. It is even possible to execute the Submit file automatically, when the system is booted, thus protecting the user from the notorious hostility of CP/M towards mankind.

Help is predictably a function which will display notes and examples of the CP/M utilities. Of more importance, Help entries can be created for use in application programs, thus making CP/M Plus potentially a very easy and simple system to use.

Other software

By far the most exciting suite of software available for the Bullet is the Config program. This allows the Bullet to read, write, format and use almost all soft-sectored, 8-bit software, including programs for the Intel 8080 and 8085 processors. Perhaps more surprisingly Config can also read, write and format soft-sectored 16-bit software. This has exciting implications for both the single user and the software houses.

Fig 2. Selection of manufacturers systems accessible via Config suite

NCR PC
Kaypro
IBM 3740
Osborne 1
DEC Rainbow
Rank Xerox
Superbrain
Epson QX 10
Casio
Panasonic 3500
Hewlett Packard
Beehive Topper

It is now possible for a software house to produce software on the Bullet and then use Config to produce disks for other machines. For the user it means — at last — that he can update his computing without having to re-write or replace his existing software.

The theory behind Config is basically simple, revolving around the condition that the disks used must be soft-sectored. Soft-sectoring means that the description of the sectors, or boundaries, is held in memory and not physically marked on the disk (hard-sectored). It is then feasible to create this information in RAM and so configure a disk drive in such a way that it can successfully use another system's disks.

There are currently forty machines on the list which Config can use, although this no doubt will grow, and Manorex seems willing to listen to suggestions (remember the portable version of the Bullet?). Fig 2 above shows a selection of those available and is intended only as a guide to the potential of this package. Config is sold separately and with only one machine's format specified. Others are available at an additional cost.

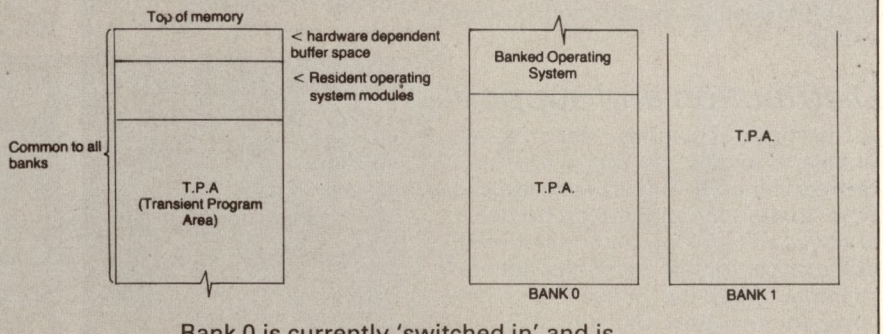
Since the Bullet runs under CP/M, there is a large range of instantly available software including word processors, spreadsheets, menu processors and accounting packages. In addition, there is also an impressive list of high-level languages supported by the Bullet including CBasic, MBasic, C, Cobol, Forth, Fortran, Lisp, Pl/1 and Pascal.

MBasic was included on the system disks, but included no surprises and hence doesn't warrant comment.

Documentation

This is the one area of the Bullet that particularly concerns me as, at the moment, the supplied documentation is far from satisfactory. Though a predictable outcome of the custom-design of the system, it results in the user being presented with a motley collection of unrelated manuals. I would suggest that the solution lies in the use of a loose-leaf system with the relevant information being selected and correlated along with basic setting up instructions. Manorex tells me that it

Fig 1. Memory organisation of banked system



Bank 0 is currently 'switched in' and is available to the processor

has such plans in mind but it would involve a lot of work and I'll believe it when I see it.

The Wave Mate Bullet manual is an excellent guide to the workings of the Bullet. Unfortunately, Wave Mate's definition of the Bullet is only the board and it is unlikely that the average user will be interested in the use of each of the forty pins of the DMA chip! Nor is he likely to want to think about such things.

Until this documentation is re-written, my advice to any potential buyer of the Bullet is: get your dealer to show you how to set it up then head straight for the CP/M manual and go on from there.

Future developments

Should 128k of banked memory be insufficient to satisfy your requirements then perhaps the answer lies in the forthcoming SuperBullet. This features 256k arranged in four banks of 64k and therefore with an additional DMA to manage the extra memory. In addition to CP/M the SuperBullet will run under the multi-user MP/M supporting up to four users (which explains the need for the two extra RS232 interfaces). The SuperBullet should be available this month.

May will probably see the launch of the networking facility predictably known as Wave Net. It will apparently use the standard ring configuration with up to 254 Bullets plugging into the communications ring. Manorex tells me there is a working model in which there are three Bullets happily chatting to each other. Data transfer rates are reported to be the same as a PIP copy for files held on disk but faster for data held in RAM.

The main advantage of such a system is that peripherals can be shared between users as well as establishing common data stores. A single Bullet with winchester drives would act as the file manager for the others in the network. It is in systems such as this, as well as the SuperBullet multi-user, that the CP/M security systems will be most useful.

Distribution and support

At the time of writing, Manorex was unable to supply me with a full list of dealers in the UK. This is because at that time it had only appointed one dealer and was still looking for others to fulfil plans of a complete UK dealer network running under the control of a new company Manorex UK. But according to Manorex a typical dealer will have a full working knowledge of both the Bullet and CP/M. He will also be able to offer customers full after-sales service and support which would operate on a repair or replacement by return system.

Dealers would also be expected to keep Manorex's track record for delivery of standard products from stock, and an average delivery time for customised machines would be three weeks.

I'm not convinced that such people actually exist but it would indeed be a nice change to have a dealer who actually knew something about the system he was selling!

I was very impressed by the attitude that Manorex displayed towards the industry and it is a sad reflection on the industry that the company is such an exception. I am particularly referring to its policy of not advertising products until ready for shipment. Manorex wouldn't give me advance information on SuperBullet and Wave Net until it had full working models.

I'm afraid I have to report that I have spoilt Manorex's otherwise faultless reliability record since, due to a power problem which has plagued our office for some time, the Bullet wiped out the entire Benchtest report as well as drive B.

To clear up any possible confusion it's probably best if I mention the activities of DTI Europe which is the official Wave Mate agent in this country and therefore has more than a passing interest in Manorex's activities. It is primarily a terminal manufacturer and therefore sells only a single Bullet system such as the model tested. Although there are no joint projects planned between the two companies they claim there is no conflict between them since they both feel they are satisfying different market needs.

Benchmarks

BM1	1.2
BM2	3.7
BM3	7.8
BM4	8.4
BM5	13.7
BM6	20.4
BM7	32.6
BM8	27.4

All timings in seconds. For a listing of the Benchmark programs, see 'Direct Access'.

Prices

The pricing of a Bullet will obviously depend on the system you choose. Since there is an almost infinite number of possible variations I will restrict the prices section to some examples. The price of a system ordered will largely depend on the number and choice of disk drives selected, coupled with the additional cost incurred in building a housing to your own specifications.

Bullet board	£600
Desk-top model (the review machine)	Consisting of a Bullet board, twin 5¼in disk drives, manuals, CP/M Plus, a Visa terminal and MBasic. £1500
Built-in desk unit	As for the desk-top version plus two each of the varieties of floppy disks, plus a 10Mb hard disk and housed in a custom-made desk unit. £5000.
Config suite	£380.
Visa/Qume terminals	£525.

Conclusions

The Bullet micro offers some attractive features, probably the most important one being the facility offered by Config. This makes it possible to upgrade your system while still allowing you to use your existing software. The running of CP/M Plus in the Bullet makes it into a 8-bit computer that can compete favourably, with regard to speed and performance, with its so-called 16-bit superiors.

The main reservation I have about the Bullet is, as mentioned before, the inadequate documentation. Should this problem be resolved quickly then the Bullet may well steal a march on its UK competitors with its ability to offer a user exactly what he wants through customised computing. END

Technical specifications

Processor	Z80A running at 4MHz.
Memory	128k RAM arranged in two banks of 64k.
Appearance	Physical appearance and dimensions are dependent on the terminal and housing you select.
Disk drives	A choice of 3½, 5¼ and 8in floppy drives and 5, 10 and 15Mb winchester hard disks.
Operating systems	CP/M 2.2 and CP/M 3.0 banked version.
Other software	Wide variety of off-the-shelf CP/M packages available.

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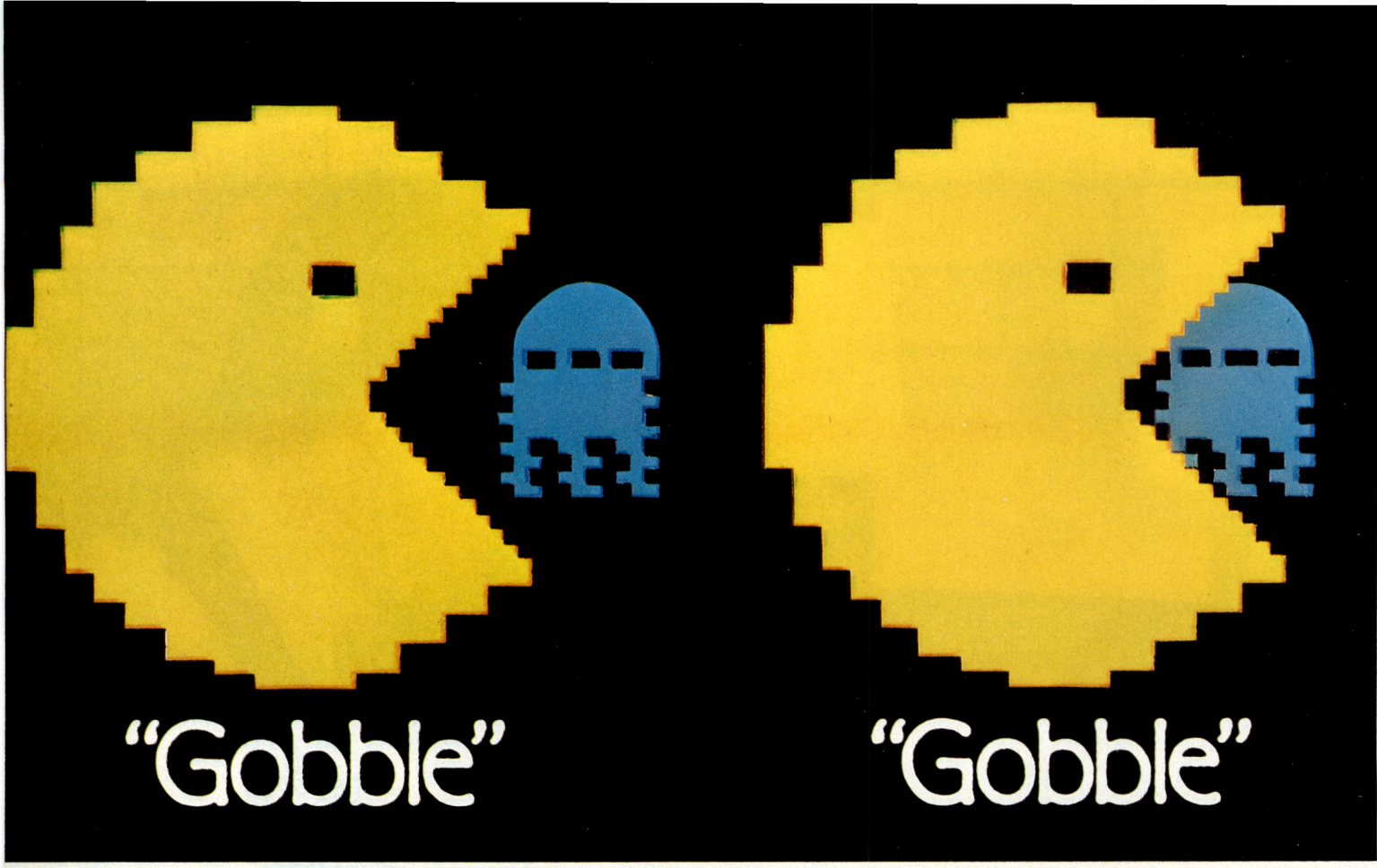
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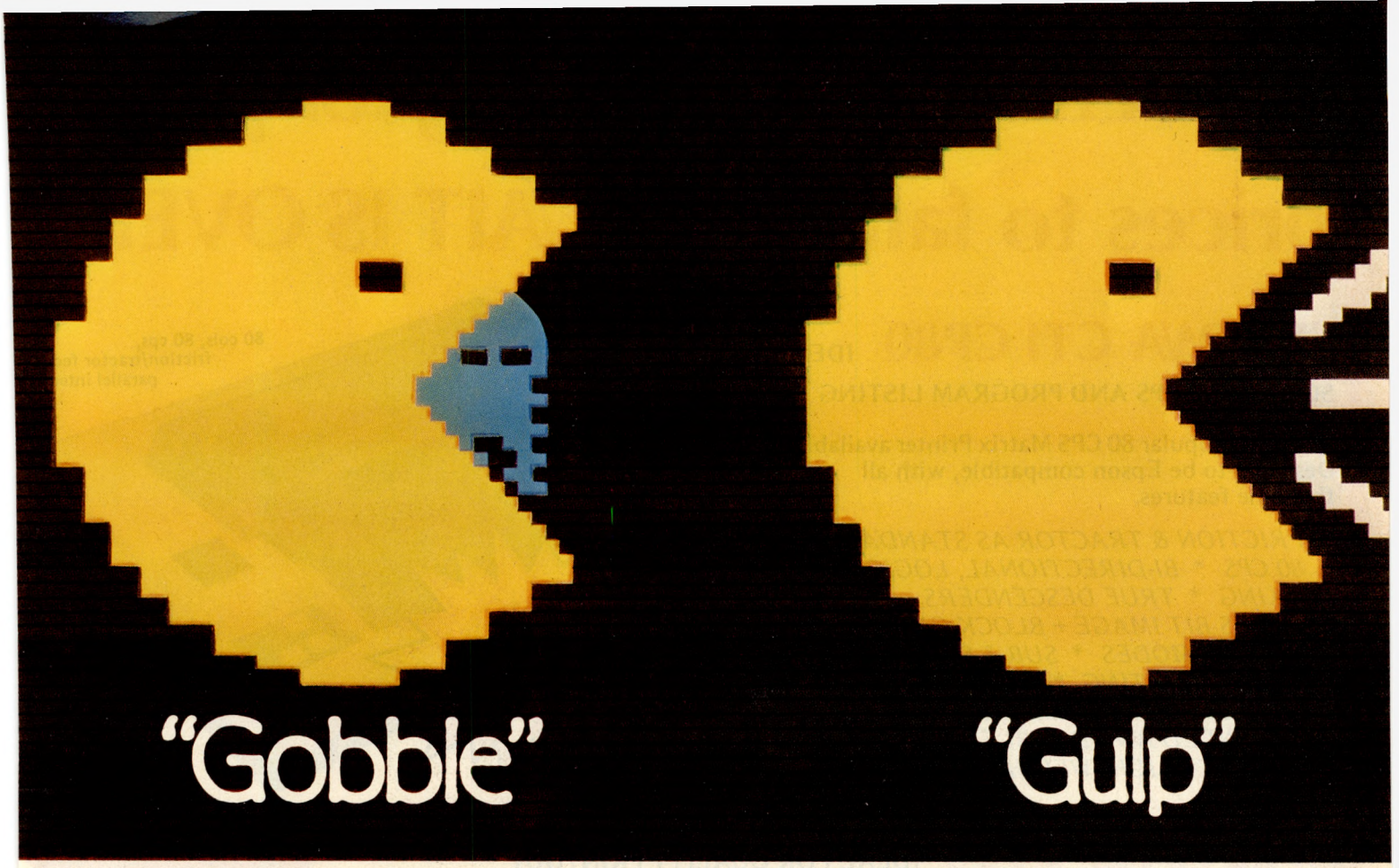
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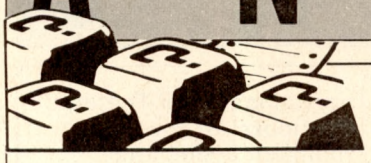
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Transfers

Can I request that either in this section of the magazine or in a full article, *PCW* give some help on a problem which is, I feel sure, fairly general but which may best be explained by my personal dilemma. This goes as follows:

1. I spent last year doing a research project on using a computerised questionnaire for pregnant women at their first hospital visit, during which time I used a SWTP computer (6809 procesor with Flex), plus 5in disk drives. Not only did I write a very complex set of Basic programs, but I also used the Stylo word processor on the same machine to write a great deal of material which I now wish to incorporate in a thesis.

2. For reasons outside my control my programs were subsequently rewritten on an Apple by a company based in London.

3. I no longer have any access to either of the above machines but I now have a BBC B machine which I am using to type my thesis, and onto which I would gradually like to transfer my set of programs. I hope to upgrade this as soon as possible with a second processor.

I fully understand that the versions of Basic are incompatible but knowing the programs as well as I do, I should be able to adapt them to run in a new version. However, it seems an immense waste of time if I have to retype every single word all over again.

Although I have never seen it happen, I understand from those who have a better knowledge of computers that it is possible to transfer ASCII or other files from one computer to another if you have the right utility; and I have had offers, which never actually came to anything, to have this done for me.

Is there really any way at all to transfer actual listings or other files, without retyping them, between any of the machines mentioned?

Are there are any machines which will allow such a transfer, and under what circumstances? For example, can one transfer an Apple listing within a suitably modified machine on to CP/M if it is inside the same machine: or from a Research Machine to and from a BBC machine: or using a Torch (or BBC with a Torch Double Disc Dive) from a BBC listing to Wordwise, by spooling to CP/M in the Torch to CP/M on another machine? Or is Torch selling two totally separate machines in one box?

If such transfers are possible are there any commercial firms willing to do such a transfer (for a fee), and if so which firms, from which machine, to which machine, and for how much?

Any help would be greatly appreciated.
RDS Fawdry, Leeds

It is possible to transfer files from one micro to another provided you have suitable hardware and software. On the hardware side you obviously need to have compatible communications ports on both machines. This usually means having RS232 serial ports working at the same baud rate with the same word length, parity, etc. On the software side you will need some kind of communications package to handle the transfer.

The software you choose depends to a large extent on the kind of data you are going to transfer and on how much you want to spend. The cheapest way of transferring a file from one CP/M machine to another is to use good old PIP. Many people say that PIP is unfriendly and difficult to use, but the fact remains it is a very powerful utility capable of much more than just copying files from disk to disk.

It is usually safest to copy ASCII files. This won't be a problem for your text files but your BASIC files will need some modification. The easiest way to do this is to load the Basic files into a word processor such as Wordstar using the non-document option. Then select the print option, but instead of printing the file to the printer, print it to disk. This will leave you with an ASCII disk file containing your programs.

On the machine that is going to transmit the file, type:—
STAT PUN:=PTP: followed by PIP PUN:=filename.ext. The STAT command will assign a logical output device to the RS232 port (for more details see **Computer Answers**, (*PCW*, August '83). The PIP command transfers the file to the logical output device.

On the machine that is to receive the file, type STAT RDR:=PTR: followed by PIP filename.ext=RDR:. Assuming you have wired the RS232 cable up correctly you should be able to get the machines to talk to each other.

However, there are two problems with PIP. The first is that it will only work at slow baud rates (usually 75 or 300 baud), the second is that because it has very poor error checking it is not very reliable. This may not be too much of a problem if you are copying text but if you are copying programs it could lead to trouble! A better way of transferring files is to use one of the commercial utilities such as BSTAM or ASYNC which use much more advanced error checking. BSTAM is widely used but is not very friendly, and only runs on CP/M or MS-DOS machines, whereas ASYNC was written for the Apple and may be a better bet.

As far as commercial copying is concerned, a quick look through Micromart revealed a company called Grey Matter which says it can copy disks. Grey Matter can be reached on (0364) 53499.
Peter Bright

?????

Third drive

I have an IMS 5000 (which is a Z80, CP/M, S100 machine) with two double density, double sided 5in disk drives each providing about 300K storage. Their format is unique, so I have great difficulty in buying software from any but the largest suppliers, and no one else can read my disks (for example, for photosetting from them, which I want to do several times a year). Nor are 8in disks any use as my supplier no longer has an IMS 5000 in stock to copy onto.

The manufacturers say it is not possible to change the format, nor to add a different controller for a third drive, which surprises me as there is room for one in the case, intended for a hard disk.

Can you suggest how I could run a third 5in drive (rather than 8in if it's cheaper) with a more common format? This would be an 'occasional' drive, for receiving new software or sending texts for photosetting, so I could use the free parallel port and a stand alone drive if necessary.

As you can see, I have

tried every conceivable source, without success. I would appreciate your help.
G Peter Winnington

There is no way of adding a third floppy drive to the IMS 5000. Each floppy drive requires the appropriate control circuitry, and the IMS only has controllers for two floppies and one Winchester.

The easiest solution is to transfer programs and files via the file-transfer or communication package. If the two machines can be directly linked using the RS232 ports, you can transmit and receive files using PIP or BSTAM. PIP is a cheap method of transferring files since you will already have the utility on your system disk. See the reply to R Fawdry on this page for details of the use of PIP in this way.

BSTAM is a direct-link file transfer package costing around £300. It is slow (around 20 mins for a 680k disk) but the built-in error checking means it is quite reliable.

If a direct link is possible, then you will have to transfer files over the phone using a modem or acoustic coupler and some form of communications package such as ASYNC (again, see the reply to R Fawdry).
Surya

Typewriter connection

How can I interface an Olivetti Praxis 35 electronic typewriter to my Sharp MZ-80K in the cheapest and best way possible? I do not have any other peripherals to attach.
Jaswinder Kaur, Gravesend

Assuming you have some practical electronic skill, or know a local enthusiast who has, then you can do this quite cheaply. Maplin Electronic Supplies, Southend (0702) 552911, offers a ZX81 input/output port kit (LW76H) at £9.25 which can be used to equip your MZ-80K with a parallel output port. *Wireless World*, August 83, published an RS232 interface for the Praxis which could be easily modified to a parallel interface. The character codes used by the K are not standard ASCII, and you can allow for this either by reprogramming the EPROM in the Praxis interface which converts from character code to key matrix code, or by patching your Basic to translate the codes. The print drive routine starts at 3BA1H, and *PCW*, March 83 gives details of how to modify Sharp Basic.
Peter Amey & Mike Flanders

Memory locations

According to the BBC User Guide (page 502), memory locations &00 to &6F of zero page are reserved for Basic language. Does this mean that, if I write a program totally in machine code, I can use these locations for variables without risking the possibility of data corruption by the operating system?
G J Slade, Southampton

Memory locations &00 to &6F of page zero are indeed used by Basic and you could theoretically use this space in machine code routines. Most machine code, however, is dependant upon Basic if only to save and load it to/from disk or cassette. It would be far easier to use some other area of memory such as that reserved for user definable character definitions.

If memory is a problem, it is possible to add 'sideways RAM' to your machine. This can increase the available memory by anything up to (in theory, at least) a megabyte! The address of a supplier of a sideways RAM board is given below.
Solidisk Technology Ltd
87 Bournemouth Park Road
Southend-on-sea
Essex SS2 5JJ
(0702) 613081
Surya

High level database

I read your 'data collater' article in the December issue, but it does not contain some relevant information. I require a relational database which interfaces to a high level language, preferably Fortran, and yet runs on a micro.
J A Kirkham, University of Bradford

There are a number of packages that can interface to high level languages. Micro-Rapport from Logica has an interface to Fortran, but Logica has withdrawn the old 8 bit version in preparation for the release of their new 16 bit version, which won't be available for three or four months. Other packages which you may like to look at are DBMS III from Tamsys and Dataflex from Equinox.
Peter Bright/Kathy Lang

Lookalike

Being a micro owner, I am thinking of buying a larger computer. Could you explain why some computers are called 'IBM lookalikes' and what exactly is the IBM computer? I know IBM is a firm so why the 'lookalike'?
Chris Green, Deal, Kent

The IBM PC is a 16 bit home/business micro. It uses an Intel 8088 processor running the PC-DOS operating system. The term 'IBM lookalike' covers a multitude of sins. In its broadest interpretation it covers any micro that uses the Intel 8088/86 processor and runs MS-DOS (MS-DOS is virtually the same as PC-DOS). The definition of 'IBM lookalike' I prefer is that you can take a disk out of an IBM and put it into the 'lookalike' machine and it will run quite happily. Very few machines can do this, as they not only have to look like an IBM but also think like an IBM.
Peter Bright

Advanced technology

My school friends and I use mini computers at school and we are interested in advanced technology in this field and how it may affect us now and in the future. Can you recommend any educational books that would be easy for us to understand? I am 16 years old.
Stephen Freeman, London N7

There is a great diversity of books introducing micros and computers in general, of equally diverse quality. One book I whole-heartedly recommend to everyone is the excellent *Usborne Guide to Computers* published by Usborne. I didn't write it and I'm not on a commission, so my recommendation is entirely unbiased! It's aimed at quite young children, with lots of cartoons and illustrations, but offers a very easy and accurate introduction for people of any age.

Other than that, we have a book review spot called Bibliofile in which Linnet Evans keeps up-to-date on the latest micro books.
Surya

END

Kuma

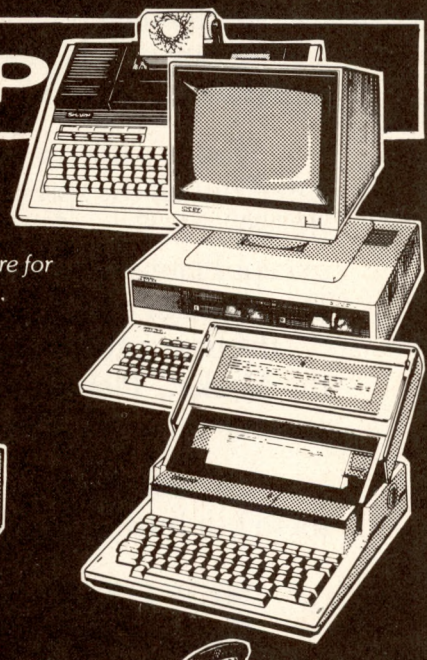
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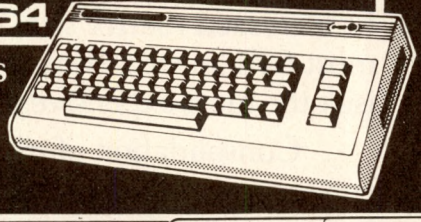
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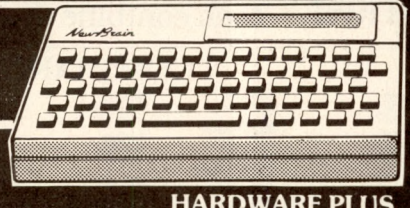
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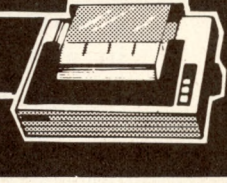
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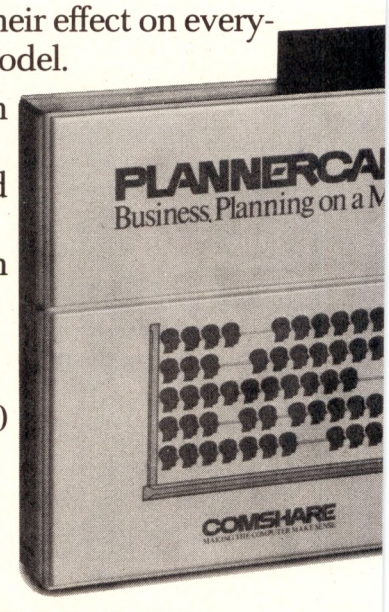
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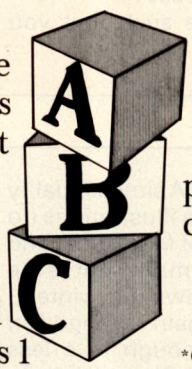


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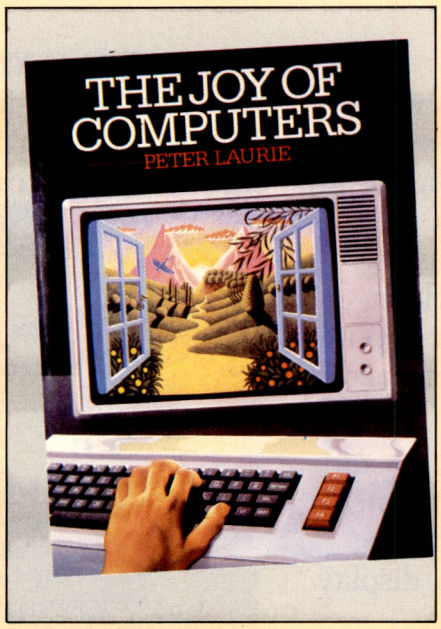
From 'where-to-put-what' handbooks to visual imagery: Linnet Evans bridges the literary computer gap.

The Joy of Computers

Consenting persons over 21, on first espying the sleeve of this book, may recall with nostalgia a similarly-titled volume concerned with intimate human relations. This is not a bad thing (no, not the sex bit): Peter Laurie has produced an eminently adult volume in recognition of an industry that has come of age.

The Joy of Computers is recognisably one of a new generation of computer related publications. Pac-Man and partworks have stalled, but the facts of real life — cars that are hand-built by robots and then talk back at the driver, trendy vicars getting flower rotas through the 6502 and the collected works of John Wesley onto Dysan — remain real enigma variations.

A large-format hardback book, *The Joy of Computers* is produced to an appropriate standard, with lots of colour photos and line drawings eased into the text. The hundred and eighty-plus pages have been split into four main sections with separate chapters



therein: 'The Computer' (that is, mainly hardware); 'Programming'; a prolific 'Professional Computing'; and a non-prophet-making 'Progress'.

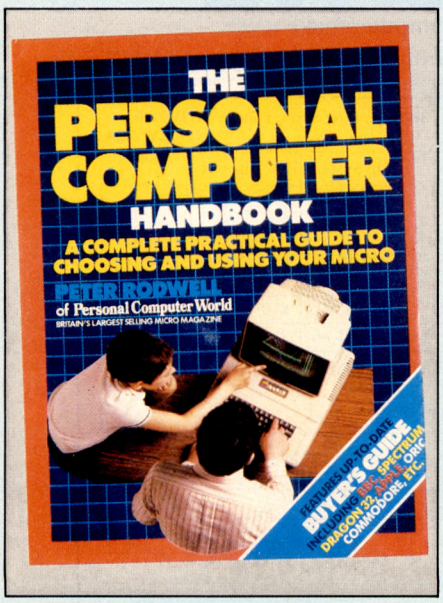
The arrangement is such that you could, given a clear head and a steady hand, binge your way directly from cover to cover. Alternatively, you could readily use it as a reference book since given topics do manage, subtly but firmly, to stay together with their close relations in one chapter.

If computer literacy has replaced carnal knowledge — and *that's* one for another day — then Peter Laurie has at the very least brought with him the conviction that a lump of silicon is as accessible, manipulable and vulnerable as whatever it's put out to grass. Despite my earlier 'adult' tag, an eager 12-year-old should find plenty of readable relevance herein. Finally, though there's some element of entertaining the converted, the complete novice should feel more informed and forearmed on closing the covers of *The Joy of Computers* than after any other comparable book I can think of.

Anyway, who needs sexy software?

The Joy of Computers
Peter Laurie
Hutchinson
£9.95 (hardback)

The Personal Computer Handbook



Another large-format, all-about-everything project, *The Personal Computer Handbook* is a blood sibling to *The Joy of Computers*. A similar quality production, even more illustrations (to the point sometimes of fussiness), and a big red visual impact mark it out as the snappiest dresser in town this winter.

Material is once again arranged in category headings, though in a less exact and exacting way. The quick dip in search of, let's say, a few choice words on memory can now unexpectedly turn into a swim across three or four separate sections. In this squally climate, reading directly from start to finish can be done, but it's more of a challenge. Clearly I don't care for verbal aerobics, but not everyone will feel so bemused.

The Handbook publicly offers many handles and bootstraps for the beginner, and quite neatly acts as an everything-we-think-you-wanted-to-know agony aunt. But could specific questions of what-plugs-in-where, and their didactic answers, be better dealt with by a dedicated owner's manual? In part, as a consequence, other subjects tend to be dealt with brusquely or not at all. In comparison to *The Joy*, it's less easy for the novice to gain real understanding as opposed to factual knowledge.

Both books conduct quite torrid affairs with the Basic language, spawning many and prolific listings. Peter Rodwell wins here with an overview of alternative languages and their applications. Rather typically, however, his sound evaluations become blunted by an obsession with syntax.

In line with current practice, *The Handbook* carries a final section where names are named and numbers numbered — a curious *pot-pourri* from the ZX81 to the £4000 Sord M223. Days could be numbered however: along with the frequent in-text reference to specific models and features, the gaffes are inevitable and already there.

That this format of book exists at all is a tribute to the number of (personal) computers that have been sold in this country, but for something that is, at the end of the day, as big an investment for the publisher as it is for the punter, this kind of date-stamping is surely unnecessary.

The Personal Computer Handbook
Peter Rodwell
Dorling Kindersley
£12.95 (hardback), £8.95 (paperback)

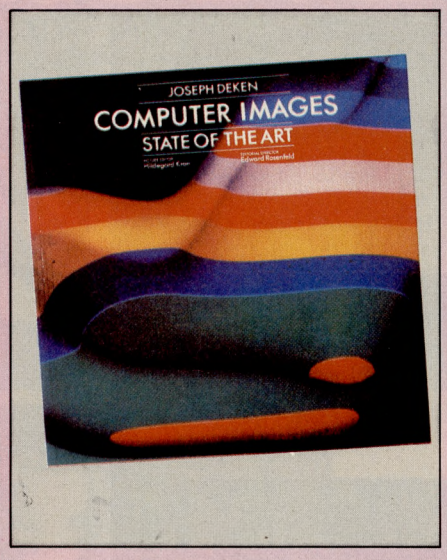
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Computer Images: State of the Art

'Computer imagery is not only a matter of more pictures being generated, but an entirely new form of visual communication . . .' Thus says Joseph Deken in the Introduction, before spending the next 200 pages of *Computer Images* in extremely colourful company trying not to get his medium-and-message knickers in a twist. Or maybe you're supposed to be looking at the pictures . . .?

Of course, there's nothing new under the sun. Every other artist in the middle ages was wrestling with the problem of how to represent depth and dimension on canvas as they 'saw' it in life. The hidden ingredient, the laws of perspective, were formulated in due course and became thenceforth something which, apparently, every schoolboy knows.

Today, faced with the same problem, the CAD/CAM operator can twist it, turn it, flatten it and stick it back in the filing cabinet. If he's not doing that he's essentially re-creating man more or less in his own image. To be honest, I



wouldn't care to meet the extraordinary composite of Brezhnev, Reagan, Thatcher and friends on a dark or any other night: will fluid dynamics offer us new dimensions of political insight?

The curious aspect is that despite being just a few years old, and generally limited by hardware demands to a few rarified circles — not all of them military — computer images already have a sharp stylisation, a *déjà vu* quality of their own.

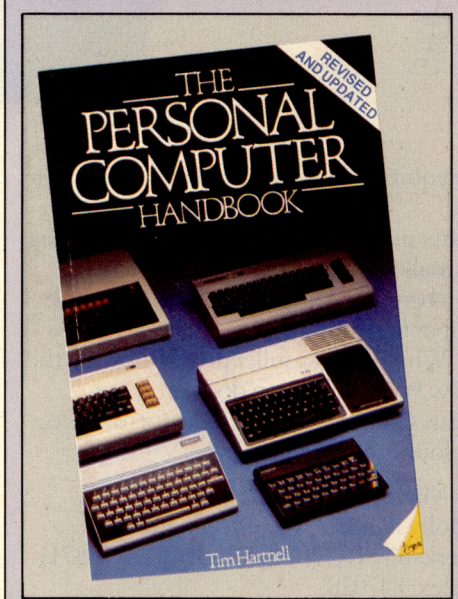
This is no criticism of Deken. Indeed, his search has been wider, deeper and apparently more trenchant than the efforts of one or two similar publications in recent times. His text too, in summarising what's punningly subtitled *State of the Art*, is remarkably stable and smiling considering the potential size and volatility of what he's up against.

Just to thwart the notion that there's nothing new in computer images, the two-tone brown swirl at the end is not something from Cadbury's gone berserk, but three dimensional fractal imagery, never before imagined.

And just to prove you don't always need a VAX 11/780 to get started, the dance routines in the 'Visualisation' section were all mapped on the Apple II.

Computer Images: State of the Art
Joseph Deken
Thames & Hudson
£15.00 (hardback), £9.95 (paperback)

The Personal Computer Handbook



It's second edition time for this particular *Personal Computer Handbook*, emphatically *nothing* to do with the other of the same name reviewed above. Frankly, little seems to have changed since the first edition.

The jacket describes the innards as 'a unique introduction to the fascinating world of . . .'. If it is unique, then there's hope for us yet. After a cheery but brief intro signed by Mr Hartnell himself, a somewhat halting history of computers is followed by a sensible but ultra-normal 'What can I do?' piece.

Centre stage is the star turn, a review of 28 regular and four pocket computers. Each on gets a page-plus of text, generally quite informative and analytical but always over-long for what it has to say. Alongside is a haggared PR pic and a summary of prices. The choice of models, even allowing for personal choice and private mishap, seems at least 30% out of date: should we really be seeing the Sharp MZ80-A when the Dragon, Oric, Lynx and many more go unsung (and when Sharp has in any case three other models on view)?

To close, there's a tomorrow's world section buzzing on Prestel, AI and LANs plus listings of user groups, glossary and bibliography.

Four quid is not, to be sure, a lot of rnoney to spend on a book. But the punter sees something which has a sensible-sounding name, a professional-looking jacket, an author they've even heard of, and the logo of a publisher who — back in the seventies anyway — used to be positively streetwise. He also ends up with (knowingly or not) a terrible disappointment which says nothing special and could in some ways be quite misleading, plus four green ones down the pan.

I wonder what happened to all those first edition copies?

The Personal Computer Handbook
Tim Hartnell with Stephen Pugsley
Virgin Books
£3.95

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NEWCOMERS START HERE

This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in PCW. *While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!*

Probably the first thing you noticed on picking up this magazine for the first time was the enormous amount of unintelligible-looking jargon. Well, in the words of *The Hitch-hikers' Guide to the Galaxy*, don't panic! Baffling as it may sound, the jargon does actually serve a useful purpose. It's a lot easier to say VDU, for example, than 'the screen on which 'the computer's output is displayed'. This guide is intended to help you find your way around some of the more common 'buzzwords' you're likely to come across in the pages of *PCW*.

For those completely new to computing, let's start with the question: what is a microcomputer? We can think of a micro as a general-purpose device as opposed to a typewriter which can only be used for typing, a calculator to perform calculations, a filing-cabinet to file information and so on. A micro can do all those things and more.

If it is to be of any use, a general-purpose device needs some way of having a function assigned to it. We do this by giving the computer a set of logical instructions called a **program**. The general term for computer programs is **software**. Every other part of a microcomputer system is known as **hardware**. 'If you can touch it, it's hardware.'

Programs must be written in a form the micro can recognise and act on — this is achieved by writing the instructions in a code known as a **computer language**. There are literally hundreds of different languages around, the most popular of these being **Basic**. Basic is an acronym of **B**eginners' **A**ll-purpose **S**ymbolic **I**nstruction **C**ode. Although originally intended only as a simple introductory language, Basic is now a powerful and widely-used language in its own right.

Other languages you're likely to come across in *PCW* include **Forth, Pascal, C** and **Comal**. These are known as **high-level** languages because they approach the sophistication of a human language. You'll also see references to the **low-level** languages, **assembly language** and **machine code**. We'll look at high and low-level languages in a moment.

The heart of a micro, the workhorse, is the **processor** or **Central Processing Unit (CPU)**. The processor usually consists of a single silicon chip. As with computer languages, there are a number of different types of processor around, the Z80, 6502 and 8088 being the three most common. The processor is nothing magical — it's just a bunch of electronic circuits. It's definitely not a 'brain'.

Being electronic, the processor's circuitry can be in one of two states: on or off. We represent these two states by **binary** (base two) notation, the two binary digits (known as **'bits'**) being 0 and 1. It is possible to program computers in binary notation, otherwise known as **machine code** (or machine language) programming.

Machine code is called a low-level language because it operates at a level close to that 'understood' by the processor. (Languages like Basic are known as high-level languages because they are symbolic, operating at a level easily understood by people but not directly understood by the processor.)

Between high-level languages and machine code is a low-level language known as **assembly language** or, colloquially, **assembler**. This is a mnemonic code using symbols which the processor can quickly convert to machine code.

Since there is no binary equivalent of a comma or the letter 'a', for example, we need some sort of code to represent each character to be processed by the computer. In order to simplify communication between computers, a number of standard codes have been agreed on. The most widely used of these codes is the **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange, **ASCII**. This system assigns each character a decimal number which the processor can then convert to its binary equivalent.

There are two types of program to do this translation for us. The first of these is a **compiler** which translates our whole program permanently into machine code. When we compile a program, the original high-level language version is called the **source code** while the compiled copy is called the **object code**. Compiled programs are fast to run but hard to edit. (If we want to change a compiled program, we either have to edit it in machine code (extremely difficult) or we have to go back to a copy of the source code.) For this reason there is a second translation program: an **interpreter**. An interpreter waits until we actually run (use) the program, then translates one line at a time into machine code — leaving the program in its original high-level language. This makes it slower to run than a compiled program, but easier to edit.

There are two strange-sounding Basic words you're likely to come across: **POKE** and **PEEK**. When you program in a high-level language, you are normally unable to choose which part of the machine's memory the processor will use to store things. This makes programming easier as you don't need to worry about memory locations, but slows down the program since the processor has to 'look up' addresses for you. Using the POKE command, however, you can 'POKE' a value directly into a desired memory address. 'POKE 10000,56', for example, puts the value 56 into memory location 10000. PEEK allows you to examine the content of a particular memory address. If you were to follow the above POKE with 'PEEK 10000', the computer would respond by displaying the value 56. (POKEing and PEEKing is normally done to increase program speed. It's a compromise between Basic and machine code.)

So far, we have a processor and a program. Since a computer needs somewhere to store programs and data, it needs some kind of memory. There are two types of memory known as **R**ead **O**nly **M**emory (**ROM**) and the badly-named **R**andom **A**ccess **M**emory (**RAM**). ROM is so-called because the processor can **'read'** (get things out of) its contents, but is unable to **'write** to' (put things in) it.

ROM is used to store **firmware**, which consists of software permanently available on the machine. An interpreter is a typical example of firmware (stick with it: it gets easier!).

RAM differs from ROM in two important ways. Firstly, you can write to it as well as read from it. This means that the processor can use it to store both the program it is running and data (information). The second important difference is that RAM needs a constant power-supply to retain its contents: as soon as you switch the computer off, you lose your program and data.

Memory is described in terms of the number of characters we can store in it. Each character is represented by an 8-bit binary number. 8 bits make one byte and 1024 bytes make one **kilobyte** or **1k**. 32k, for example means that the computer can store about 32000 characters in its memory. If 1024 sounds like an odd number, remember that everything is based on the binary system, thus 1,2,4,8,16 ... 1024 being the nearest binary multiple to 1000.

There are numerous forms of **permanent** or **backup** storage, but by far the most common are the **floppy disk** and **cassette**.

Floppy disks or diskettes are circular pieces of thin plastic coated with a magnetic recording surface similar to that of tapes. The disk, which is enclosed in a protective card cover, is placed in a **disk drive**. Disk drives comprise a high-speed motor to rotate the disk and a read/write head to record and 'playback' programs and data.

The disk is divided into concentric rings called **tracks** (similar to the tracks on an LP) which are in turn divided into small blocks by spoke-like divisions called **sectors**.

There are two methods for dividing the disk into sectors. One method is called **hard-sectoring**, where holes punched in the disk mark the sectors, and the other is **soft-sectoring** where the sectors are marked magnetically. (The reason that disks from one machine can't be read by a different make is that each manufacturer has its own way of dividing up the disk. Recently, however, manufacturers do seem to have begun to acknowledge that this situation can't go on forever, and they are working on making their disks compatible with each others.')

Since the computer needs some way of tracking the whereabouts of everything on the disk, we have a program called a **Disk Operating System**, more usually known simply as the **Operating System (DOS** or **OS)**. The operating system does all the 'house-keeping' of the disks, working out where to put things, letting the user know what is on the disk, copying from one disk to another and so on. As you might expect by now, there are lots of different operating systems available (each with its own advantages and disadvantages). The two most popular OSs are **CP/M** (Control Program for Micros) and **MS-DOS** (MicroSoft Disk Operating System).

Floppy disks provide a reasonably fast and efficient form of secondary storage and are cost-effective for business machines. For home computers, however, the usual form of program and data storage is on ordinary cassette tape using a standard cassette recorder. This method of storage is slow and unreliable, but is very cheap and is adequate for games and the like.

Another type of disk you'll see referred to is the **hard disk**. This is an extremely efficient method of storing large amounts of programs and data. Hard disk capacity generally starts at around 10 **Mbytes** (10 million bytes) and rises to . . . well, you name it. Besides offering a much greater capacity than floppies, hard disks are more reliable and considerably faster. They are, however, much more expensive than floppy drives.

Since computers need some way of communicating with the outside world, we need input and output devices. Input and output devices include all manner of things from hard disk units to light-pens, but the minimum requirement for most applications is a typewriter-style **keyboard** for input and a tv-like **Visual Display Unit** for output. The Visual Display Unit is variously referred to as a **VDU**, **Cathode Ray Tube (CRT)** and **monitor**.

The various component parts of a computer system (processor, keyboard, VDU, disk drives, etc) may all be built in to a single unit or they may be separate, connected by cables.

Take this paragraph slowly and it makes sense! When a computer communicates with an outside device, be it a printer or another computer, it does so in one of two forms — **parallel** or **serial**. **Parallel input/output (I/O)** requires a number of parallel wires. Each wire carries one bit, so with 8 wires we can transmit/receive information one byte at a time (8 bits = one byte, remember). **Serial I/O**, in contrast, uses a single wire to transmit a series of bits one at a time with extra bits to mark the beginning and end of each byte.

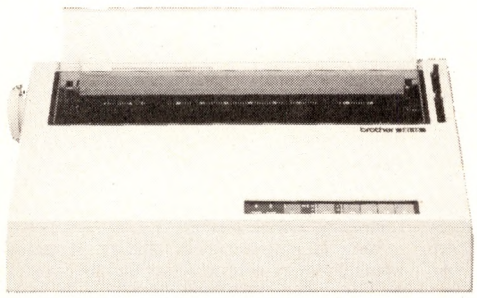
To enable different devices to communicate with each other in this way, standards have been agreed for different **interfaces**. An interface is simply a piece of circuitry used to connect two or more devices. The most common standard serial interface is the **RS232** (or **V24**) while the **Centronics** standard is popular for parallel interfaces.

When two computers want to communicate with each other over a distance, there are again two ways of doing it. Both methods use the public phone network. The simplest and cheapest method is to use a device known as an **acoustic coupler**. This simply plugs into your computer, and has a receptacle into which you place your telephone handset. However an acoustic coupler is slow and not exceptionally reliable.

A more sophisticated (and correspondingly more expensive) method is to use a **modem**. Unlike an acoustic coupler, a modem is wired into the telephone system and you should get permission for this from British Telecom.

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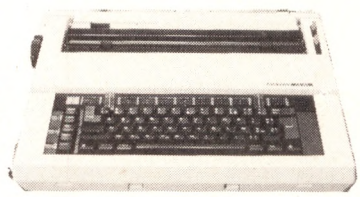
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A BEGINNER'S GUIDE TO PROGRAM CONVERSION

TRS-80/Video Genie

Surya continues his analysis of each machine on the PCW Converter Chart (see September 1983 issue). High and low resolution graphics and sound capabilities for the Video Genie and TRS-80 Model 100 are featured this month, plus the final part of the Apple II conversion.

The TRS-80 has limited graphics facilities; not surprising when you look at how long the machine has been around. The graphics resolution is 64 x 48, the origin (0,0) being at the top left-hand corner of the screen. Thus:-

```
100 Rem: A totally pointless program
110 CLS: Y=0
120 FOR X=0 TO 63 STEP 1.3
130     Y=Y+1
140     SET ((INT(X)),Y)
150 NEXT X
```

draws a line diagonally across the screen.

The graphics statements are SET, RESETand POINT. SET(x,y) lights the block at coordinate (x,y). RESET switches it off again. POINT(x,y) tests the specified point, returning –1 if it is lit and 0 if not.

The TRS-80 also supports a PRINT @ statement. This allows text to be placed at a specified location on the screen. For the purposes of the PRINT @ statement, the top row of the screen is numbered from zero at the left-hand side to 63 at the right. The next line is numbered 64 to 127, and so on to the bottom line, 960 to 1023. To print at the bottom line, for example, you simply PRINT @ 960, thus:-

```
100 PRINT @ 960, "This is printed on the bottom line";
```

The semi-colon at the end of the PRINT statement supresses the line feed which would otherwise scroll the screen upwards.

The TRS-80 does not support sound as standard.

The Video Genie

The Video Genie, usually known simply as the Genie, is a Japanese imitation of the American TRS-80. Unlike most imitations, however, the Genie is every bit as good as the original. The TRS-80 is slightly fussier about syntax than the Genie, but the two are all but identical. Most Basic programs are interchangeable. In *PCW's* Programs section, I use the label TRS-80/Genie to describe programs written on either machine.

The TRS-80 Model 100

The TRS-80 Model 100 is Tandy's portable micro. The graphics resolution is 239 x 63, and the graphics commands are PSET, PRESET and LINE. PSET and PRESET are exact equivalents of SET and RESET. Considering that LCD screens are not noted for wonderful graphics, the LINE statement is surprisingly powerful.

The format of the statement is LINE (x1,y1)–(x2,y2), a, BF. The statement draws a line from the first coordinates to the second. If a=1, the line is PSET; if 0, it is PRESET. The additions B and F are optional. If B is included, then a B)ox will be drawn with (x1,y1) as one corner and (x2,y2) as the other. If the F is included, the box will be F)illed — either PSET or PRESET, depending on the value of a.

The model 100 also supports sound (of the beep variety). BEEP beeps. 'SOUND pitch,length' plays the specified note and is similar to most sound statements.

As promised last month, we continue the Apple II guide with high-res graphics and sound.

High resolution graphics (HGR)

The HGR screen is addressed as 280 columns by 192 rows with six colours available. The Apple reserves enough memory for two high resolution screens, these being called by HGR and HGR2 respectively. Four text lines are again reserved by default and can be made available for graphics use by the statement POKE– 16302,0 and reset to text by POKE –16301,0.

Two POKEs which you are likely to find in Apple programs using the HGR mode are:-

POKE — 16300,0 to switch from HGR2 back to HGR
— 16303,0 to switch from graphics to text retaining text-windows and cursor position

In HGR mode, there are two main graphics statements: HCOLOR and HPLOT. HCOLOR=x sets the foreground colour to x, defined as:-

0 black
1 green
2 violet
3 white
4 black
5 orange
6 blue
7 white

Although there are eight codes, two are redundant (4 and 7), leaving six effective colours.

HPLOT is an easy-to-follow statement operating in a similar way to most machines' DRAW statements:-

HPLOT x,y lights point (x,y) in the current colour.

HPLOT x1,y1 TO x2,y2 draws a line from (x1,y1) to (x2,y2). Coordinates can be 'chained', so that the following HPLOT statement:-

```
HPLOT 0,0 TO 279,0 TO 279,191 TO 0,191 TO 0,0
```

draws a rectangle around the edge of the screen. Most Basics don't allow this type of chaining, so you'd have to split up each pair of coordinates and DRAW, SET or PLOT each line separately.

HPLOT TO x,y draws a line from the current cursor position to coordinate (x,y); it carries on from where it last left off.

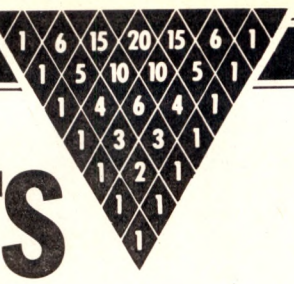
There are seven other graphics statements in Applesoft HGR mode: DRAW, XDRAW, SCALE, ROT, SHLOAD, BSAVE and BLOAD. These statements concern a feature known as shape tables. Shape tables are too complex to go into in the space available here and, in any case, the information wouldn't be much use to owners of other machines since you will find them all but impossible to duplicate.

Shape tables are a form of sprite, a kind of sophisticated user-definable character. Created by POKEing values into memory, shape tables may be saved to tape or disk for later loading. The scale and orientation of the resultant shapes can be manipulated using the statements mentioned above. Anyhow, unless you are very familiar with both Applesoft and the machine you are translating to, any program making liberal use of DRAW, XDRAW, SCALE, ROT, SHLOAD, BSAVE or BLOAD should be left well alone.

Sound

There are only two ways to produce sound on the Apple: PRINT CHR$(7) and POKEing memory location –16336. PRINT CHR$(7) produces a short beep, as with most machines. Producing anything interesting from the noises emitted by POKEing –16336 is a decidedly frustrating and not over-fruitful task, so this POKE may be safely omitted when converting to other machines.

END



Kaprekar Numbers

New readers start here. The topics dealt with in this column attempt to reach the frontiers of knowledge in number theory with the minimal background information. The problems posed therefore have no complete solution known to the author, and readers are encouraged to submit their attempts at solution, however incomplete they may seem.

(1) The legendary number theorist, D R Kaprekar, of the Indian Institute of Science at Bangalore, is perhaps most famous for publicising the number 6174, which is the eventual result *(with certain exceptions)* of the subtraction of a four digit integer whose digits are arranged in ascending order from the same integer whose digits are arranged in descending order.

For example, given the four digit integer 8923 we proceed thus:
9832 − 2389 = 7443,
9963 − 3699 = 6264,
7641 − 1467 = 6174,
7443 − 3447 = 3996,
6642 − 2466 = 4176, the process repeats at this stage.

Question A. What are the certain exceptions referred to above?

Question B. What happens to integers with other than four digits?

(2) Kaprekar Numbers, however, are defined to be those n-digit integers, K, which are equal to the sum of the integer defined by the least significant (right-most) n-digits of their square plus the integer defined by the remaining digits.

Thus 142857 is a Kaprekar Number because here n = 6 and

(i) $(142857)^2 = 20408\underline{122449}$

(ii) 122449 + 20408 = 142857

Question C. What are the Kaprekar Numbers less than 10^n for a given n?

Interest Note. The square of any cyclic permutation of a K-Number is also a cyclic permutation when the digits are added as required.

For example, $(428571)^2$ = 183673102041 and 102041 + 183673 = 285714.

Readers are invited to submit a program, or suite of programs, to answer the above questions. All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order).

A prize of £10 will be awarded to the 'best' entry received. Please address all entries, to arrive by 1 April, to Mr M R Mudge, Room 560/A, Department of Mathematics, University of Aston in Birmingham, Gosta Green, Birmingham B4 7ET.

Review—September 83

The Partitions of a Positive Integer generated a very heavy, and varied response; the extremes being typified by an estimate of 15 years to find p(100) using a TI59 programmable calculator to an offer to calculate p(535) programming in Algol 68 — on an unspecified mainframe, one suspects.

A reference work in this field is provided by GE Andrews, *The Theory of Partitions, Encyclopedia of Mathematics and its Applications,* Volume 2, Addison-Wesley 1976. However, the presentation in Chapter XIX of the fifth edition of *An Introduction to the Theory of Numbers, by* GH Hardy and EM Wright, Oxford University Press 1979 is adequate to yield the recurrence relationship for p(n) without which realistic computing is virtually impossible.

$p(n) - p(n-1) - p(n-2) + p(n-5) + \ldots + (-1)^k\ p(n-\tfrac{1}{2}k(3k-1)) + (-1)^k\ p(n-\tfrac{1}{2}k(3k+1)) \ldots = 0$

To estimate the magnitude of the computation one may use the asymptotic formula of Hardy and Ramanujan 1917,

$$p(n) \sim \frac{1}{4n\sqrt{3}} \exp\left(\pi\sqrt{\frac{2n}{3}}\right)$$

The computational difficulties are referred to in *Computers in Number Theory* edited by AOL Atkin and BJ Birch, Academic Press 1971.

The prizewinning entry is from RB Shepherd of 2 Orchard Croft, Cottingham, Humberside HU16 4HG using Pro-Pascal on a Sharp MZ80-B computer (64 kbytes). This submission factorised up to p(300) in 44hours 20mins. It must be observed that the presentation of results by RB Shepherd, and indeed by numerous other contributors, was of the highest possible standard. Congratulations all round, and keep the entries flowing.

Note. Submissions will only be returned if a suitable stamped addressed envelope is provided.

END

LEISURE LINES

by J J Clessa

Quickie

A 20lb monkey hangs from a rope which passes over a single pulley and is balanced by a 20lb weight hanging from the other end of the rope. The monkey begins to climb up the rope. Will the 20lb weight go up, go down — or stay still?

Prize puzzle

Three artists — Albert, Brian and Charles — each paint a picture on a square canvas. Brian's picture is seven square feet more than Albert's in area, and seven square feet less than Charles'. All sides have exact measurements. What are the dimensions of the pictures?

November prize puzzle

The puzzle would have presented very little problem for those of you with micros, although a little thought would have saved quite a bit of computer time — especially if you were to generate *all* 10-digit numbers rather than the smallest.

Since the required answer had to be divisible by the integers 1 to 12, it must be a multiple of 12 x 11 x 7 x 5 x 3 x 2 — that is 27720. Hence you could set up a simple loop with increments of 27720. Luckily, the solution is 1 234 759 680, which comes up relatively early in the loop.

You can cut down considerable time by tailoring the loop to skip whenever the second digit is equal to the first.

The winning entry came from D Spencer of Ruislip, Middlesex whose prize is on its way.

To those overseas entrants who were worried that their entries might arrive too late: I can't recall a case in which a late entry was from overseas.

END

The BBC Micro can now give your children a private education.

The BBC Microcomputer now accounts for 80% of the computers being ordered under the current D.O.I. Primary School Scheme.

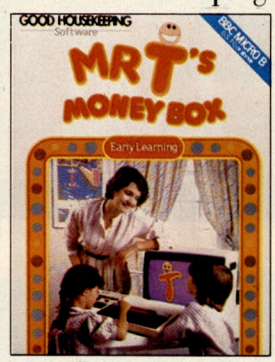
It's also the computer which a rapidly increasing number of people are choosing for their homes.

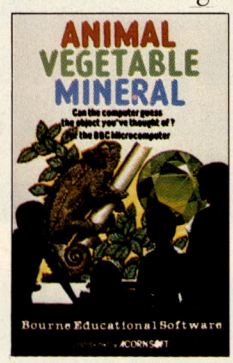
One of the reasons for its success is that it makes learning highly entertaining for everybody. From children who are getting to grips with the alphabet, to adults who want a gentle but intensive introduction to the complex world of computing.

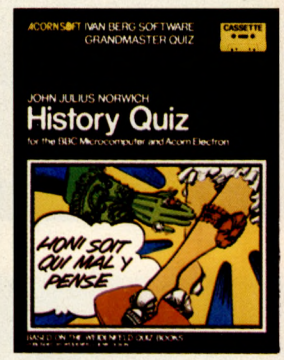
Now, there's a substantial new catalogue of educational programs specially for the BBC Microcomputer.

It has been developed by Acornsoft, the software division of Acorn Computers who manufacture the BBC Micro.









Making faces without getting scolded.

With the new Facemaker program, your children can make over a million faces. It's like an identi-kit, allowing them to depict anyone they want. They start by choosing the eyes. Then they can choose the mouth, the ears, the nose, the facial outline and the hairstyle.

And if they really fancy dressing up, they can add earrings and hats.

In doing all this, they learn to read and spell, as well as developing their powers of description.

The money program, two games for the price of one.

Mr. T. is an engaging little figment of the microchip who can teach your children all the complexities of our coinage system.

His Money Box program has two games, each of which can be played at different levels.

In Money Match, the challenge is to collect a set of coins, matching them according to shape, size and value.

In Money Box, you can give your child and Mr. T. a helping hand to get all the coins on the screen into the box. (It's always different, because the coins on the screen are based on the small change you have to hand.)

A chance to teach the Micro a thing or two.

With the Animal, Vegetable, Mineral program, the children can get the computer guessing.

They think of an object. The BBC Micro has to decide what it is.

If it doesn't come up with the answer, the children can keep giving it hints.

In doing so, they are encouraged to question the difference between such things as crocodiles and alligators, or whether oil is vegetable or mineral.

The program also encourages them to consult reference books so that they can ask the computer increasingly tough questions.

Questions on Julius Caesar from J. Julius Norwich.

John Julius Norwich's History Quiz is one of the new BBC Micro Grandmaster quiz series which also covers theatre, crime and detection, music, science fiction and royalty.

On the history front, there are 300 brain-testing questions, covering all aspects of British history from Julius Caesar to Margaret Thatcher.

And to increase the educational value, Mr. Norwich has posed the questions from angles which will give a broader understanding of events.

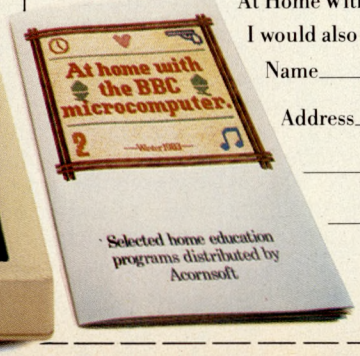
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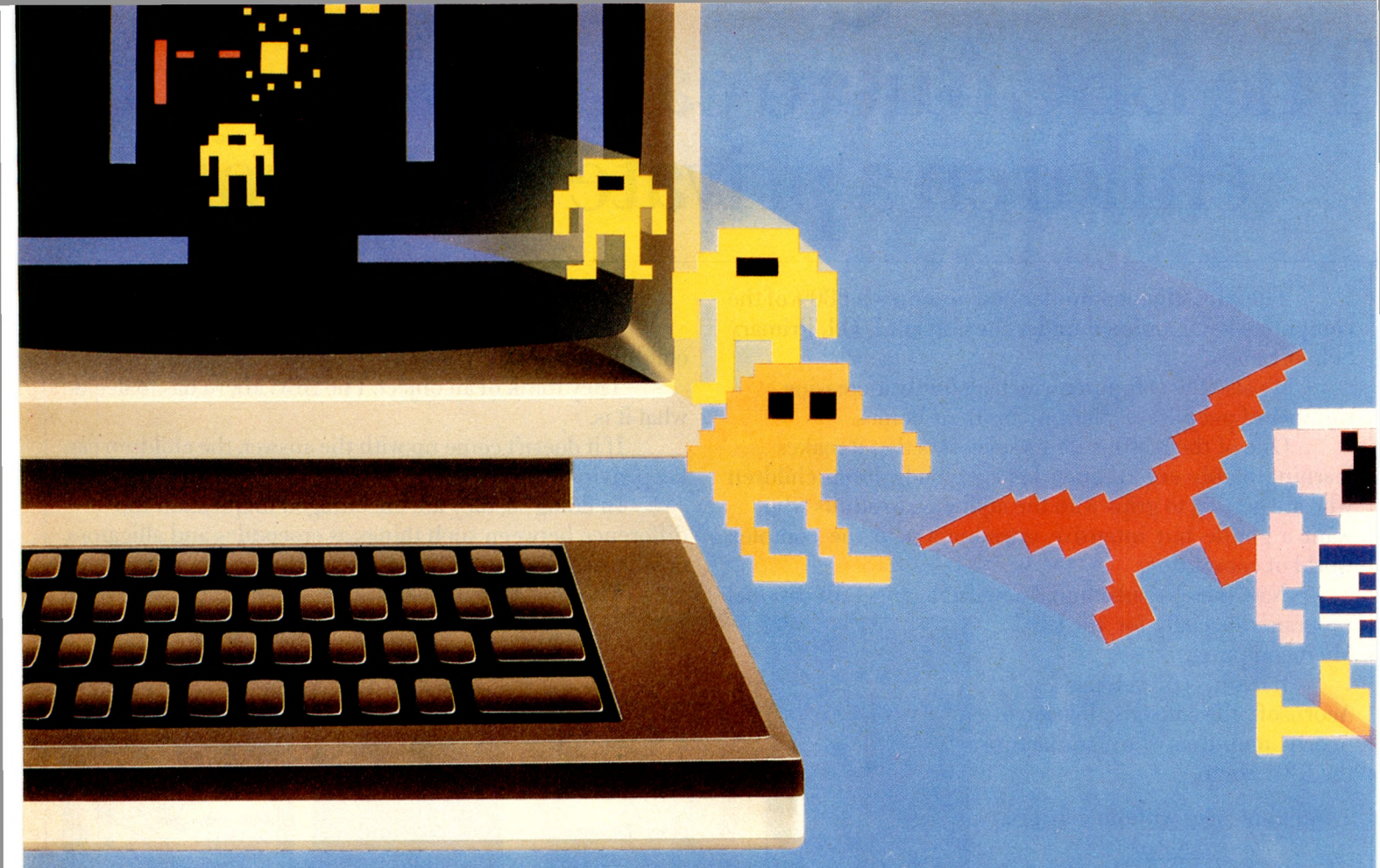
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Games Designers

Ever wished for a magical wand to enable you to convert your brilliant games ideas into viable programs? Tony Hetherington has been looking at some packages to help you do just that.

Fighting through the third screen of yet another Pac-man variant, have you ever thought you could devise a better game? If the answer is 'yes' then maybe the reason you haven't taken it any further is because you don't know how.

The main problem is that computer games programs are generally more demanding in terms of speed and graphics than, for example, the average home accounts program. These demands are probably beyond the skill of the average programmer and no doubt also exceed his computer's Basic. Unfortunately, the solution lies in machine-code. This is enough to put all but the most hardened programmer off — which is why the majority of games available, while excellent programs, contain little that is original.

However, help is at hand. For several companies have produced programs which are designed to let you program in machine-code without your even knowing it. These wondrous tools are called 'games designers'. To decide how much use a games designer would be, you need to consider the usefulness of such a product in each of the four categories: arcade, simulation, adventure and logic.

Arcade games by definition should mimic the speed and style of their coin slot counterparts. A games designer should help you to move spaceships and aliens and cope with missiles and explosions and, with luck, provide for sound effects.

Simulations cover flight and sport — they mimic actions that are familiar to the player. The graphics should be smooth and representative of the original, otherwise the game won't even be convincing, and certainly not a simulation. If, for example, you can only create jerky and uneven animation, then you might be able to utilise it for a spaceship but definitely not for a snooker ball. To create realistic simulations a games designer should incorporate the relevant laws of physics, such as collisions, inertia and friction.

A designer could help in the writing of adventure games in both the management of the game and in any graphics used to enhance it. The management should include facilities to handle movement between rooms, object and room descriptions, the setting and execution of traps and interaction between the adventurer and characters in the game.

The graphics facilities should free the user from the slow and painful process of graphic design. This leaves the programmer free to concentrate on the plot and dramatic action.

The final category to be considered is that of logic games. At first sight it seems unlikely that a games designer would be much use, since graphics and sound are used to limited effect. But logic games are spoilt by poor graphics, just as the others are, and a game of chess is enhanced by good, smooth graphics just as much as a simulation is.

After each of the following reviews of games designers currently available for the Spectrum (other machines will no doubt follow), there is an indication of usefulness. There is also a score for knowledge which indicates the amount of programming knowledge required to use the program. A mark of 1 would suggest that the program was menu-driven, easy to use and required no previous programming experience.

Illustration by Brian James

5, on the other hand, would indicate a compiler-style package requiring deep understanding of Basic before it could be used.

The Quill

Supplier: Gilsoft
Price: £14.95

The Quill is an easy to use, menu-driven package exclusively for the designing of adventure games.

Using Quill is not the trial-and-error process that it can be because the user must complete a fair amount of planning work before even loading it. To help you do this there is an excellent check-list which you should work through, which eventually leads to the creation and testing of your adventure-using Quill. Unfortunately, this list is buried in the middle of the manual so losing its effect.

When you have completed your plan of your adventure's setting and populated it with people, objects and events, you are ready to enter this information into Quill's database using the Quill editor.

To do this you have to work through each of the menu options and enter the relevant details — room descriptions, etc. Once completed, the third and final part of the Quill is used to run your adventure and reveals the true nature of the product. All you are doing is entering parameters into the interpreter which means that any adventure written with the Quill will be somewhat limited.

There is no way of enlarging or expanding Quill adventures to incorporate desirable features such as character interaction. In other words although there may be numerous characters in your adventure you will not be able to talk to them! This isn't particularly surprising since there are very few companies actually producing adventures with conversations incorporated in them. Is this really because they don't know how to do it? I suspect it's probably because they can produce several 'sausage machine' adventures using a program like the Quill in the time it would take to develop one character. If you want to join the group of people producing such games then the Quill is for you, particularly since Gilsoft only requests a mention of its product as payment.

But, if this is not sufficient for you, Quill, in its present form, has only limited value.

Finally, the Quill contains the silliest example program I have seen. The example is of a very small adventure of only six rooms (which is fair enough) with the object being to steal the diamond from the safe only to leave it in the dining room! The really silly bit is the inclusion of an apple which you have to eat or else die of starvation! Apart from the fact that if you were that hungry you wouldn't be stealing diamonds, I would have thought that an apple wouldn't have been enough to save anyone!

Verdict — an adventure sausage machine.
Arcade. 0/5
Adventure. 3/5
Simulations. 0/5
Logic. 0/5
Knowledge. 2/5

Fifth

Supplier: Computer Rentals Ltd
Price: £9.95

This was the package that started the rush in games designers and was originally advertised as a graphics extension to Sinclair Basic. Fifth is probably named to associate itself with Forth. It consists of a cassette and user manual. The manual is a forty-page booklet which explains each of the twenty-five Fifth commands. It isn't particularly well written and leaves you wondering what to do next. This could easily have been rectified by the inclusion of some example games as a final chapter to supplement the examples given for each command.

As mentioned above, Fifth is an extension to Basic and requires some Basic statements to support it. For example, the Fifth command 'LARGE' needs its five parameters to be pre-set by Basic LET statements before it can be used without error.

Fifth patches on to the normal Basic by adding on to the section that interprets the REM statement. Whenever a REM statement is encountered the interpreter checks to see whether it is a normal remark and, if not, branches out into Fifth machine.

The main claim of Fifth is its ability to move objects smoothly around the screen and so it has several commands dedicated to achieving this. OBJECT is used to define the number of objects that are to be given the same name — for example, missiles. COLOURS determine the object's colour. VECTOR is used to choose between one of 16 directions and SPEED determines the speed at which these objects trundle across the screen. The actual movement of these objects is independent of the Basic program and is handled by the Z80's interrupts. These are the signals that are sent from Sinclair's ULA chip to the Z80 processor fifty times a second. Their purpose is to tell the Z80 to scan the keyboard and update the frame counter. Fifth also instructs it to move the objects.

Once set in motion by the ENABLE command an object will continue to move until it is DISABLEd or moves off the screen. Should the latter occur then a service routine is automatically called. This is a Basic or Fifth routine which starts at a line number which is defined to Fifth using the LIMIT command. INTERACT defines a routine which will be called if two objects collide with each other. These service routines should contain statements which will redefine the object's parameters and set it on its way again. An example of the use of these service routines is in the movement of balls on a snooker table with their collisions with the cushions and other balls being resolved in a credible manner.



Should you forget the values given to the various parameters for your objects then you can retrieve this information by using the Fifth function. There are in fact 13 of these functions, each returning a numeric value. For example, STATUS will return a 1 if the object is enabled (moving) or a zero if it is disabled (stationary).

These powerful movement commands will be an invaluable aid to designers of arcade and simulation games, but what of the others? They will undoubtedly benefit from the additional graphics facilities that Fifth provides.

Fifth utilises both temporary and universal colours and includes the command TEMPS to set up these temporary colours. FILL is used to change the screen colours without affecting the screen display. REPLACE changes one specified colour combination — such as blue on red — to the current universal colours. LARGE allows you to print a string of characters of any height on to the screen up to the whole screen being filled by a single character. GET and PUT are powerful commands and are paired together. GET is used to store an area of the screen in a named string array. This can then be reproduced anywhere on the screen using the PUT command. GET and PUT provide limited animation facilities but, since a whole screen requires 6k for storage, only a few screens can be held at any one time.

As Fifth is an extension of Basic a good knowledge of Basic is required to get full use. This is reflected in the scores below and hence the top mark for knowledge. The scores for the game types also reflect this knowledge requirement and show Fifth's use to an experienced programmer. If you have only just started programming then Fifth will be of little use.

Verdict. A powerful extension to Basic.
Arcade. 5/5
Adventure. 2/5
Simulations. 3/5
Logic. 2/5
Knowledge. 5/5

Scope

Supplier: ISP Marketing Ltd.
Price: £11.95

Scope Computer Graphics Language, to give it its full title, is a collection of 31 commands which can be incorporated into Basic REM statements which are used to produce machine-code routines.

Scope has sufficient commands to allow you to write entire programs but it is perhaps of more use in machine-code routines for incorporation into your Basic programs. This explains why there are Scope words that merely duplicate Basic commands, such as BDR which performs the same function as BORDER.

Closer examination reveals that Scope isn't the wonderful new graphics language it claims to be but is little more than a souped-up assembler. A Scope program is written in assembler-style instructions and is then compiled (or assembled) to produce the required machine-code.

These assembler-style commands include VAR and BVAR, to define a single byte and an 8-byte 'big' variable. INC and DEC increment and decrease these variables. JUMP transfers to a LABEL and HALT pauses a program.

Scope programs can be arranged into routines which are called by the CALL command.

However, Scope adds some extra useful features. These include FSCR which scrolls the entire screen by one pixel in any of four directions; LIM causes a jump to a routine when a variable reaches a predefined value; and WIPE clears a specified number of lines counting from the bottom of the screen.

The other commands are mimics of Basic statements but since they are Scope commands they can be incorporated into Scope programs to give fast action graphics.

Verdict. A souped-up assembler.
Arcade. 4/5
Adventure. 2/5
Simulations. 2/5
Logic. 2/5
Knowledge. 5/5

Hurg

Supplier: Melbourne House
Price: Not available.

At the time of writing, Melbourne House was putting the final touches to its own games designer program called Hurg. Final details were not available but Melbourne's plans are presented below because I feel its existing products are of a standard that demand the product's inclusion.

Apparently a Hurg user won't require any previous programming experience since all selections are menu-driven. It is even possible to design a whole game using a joystick without ever touching the keyboard.

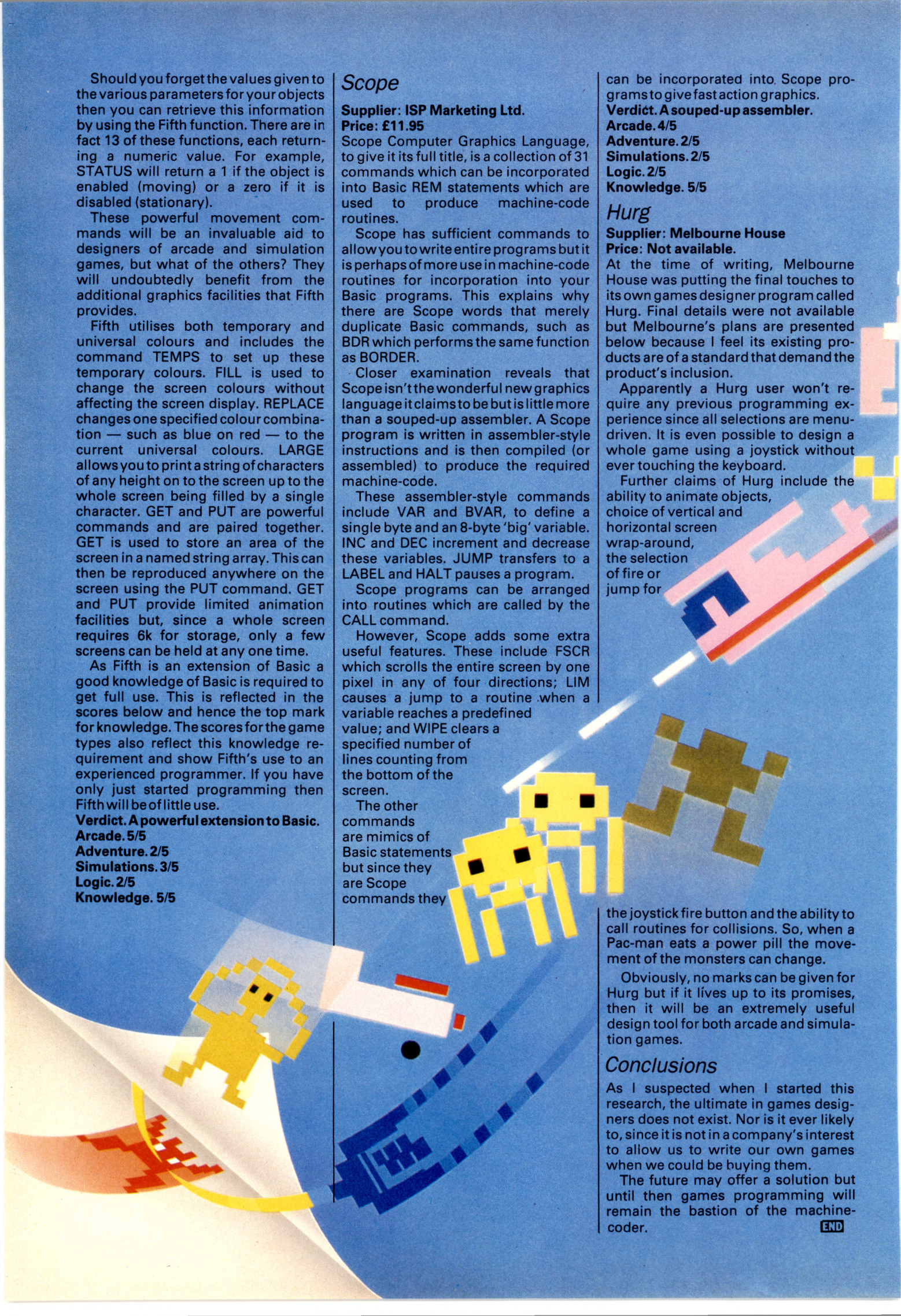
Further claims of Hurg include the ability to animate objects, choice of vertical and horizontal screen wrap-around, the selection of fire or jump for the joystick fire button and the ability to call routines for collisions. So, when a Pac-man eats a power pill the movement of the monsters can change.

Obviously, no marks can be given for Hurg but if it lives up to its promises, then it will be an extremely useful design tool for both arcade and simulation games.

Conclusions

As I suspected when I started this research, the ultimate in games designers does not exist. Nor is it ever likely to, since it is not in a company's interest to allow us to write our own games when we could be buying them.

The future may offer a solution but until then games programming will remain the bastion of the machine-coder. END



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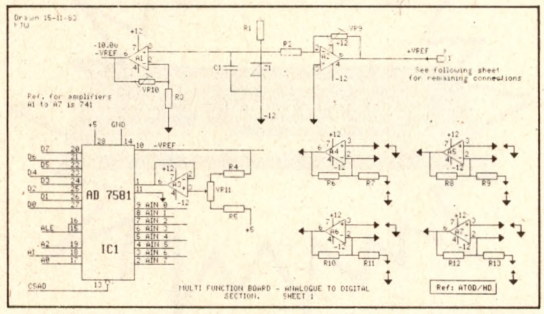
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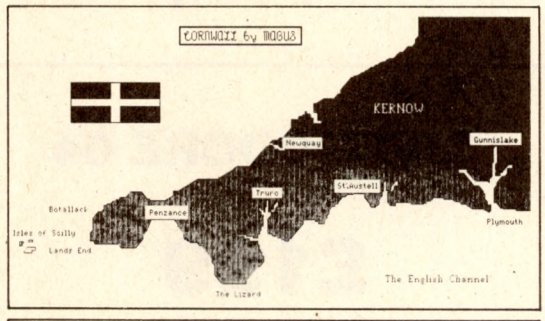
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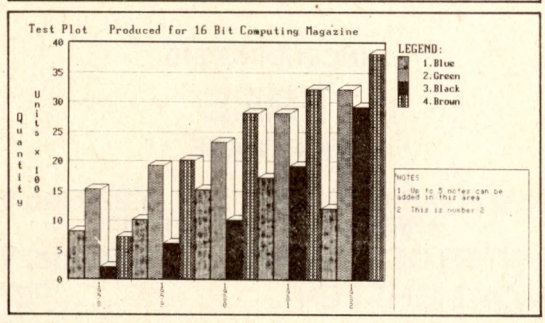
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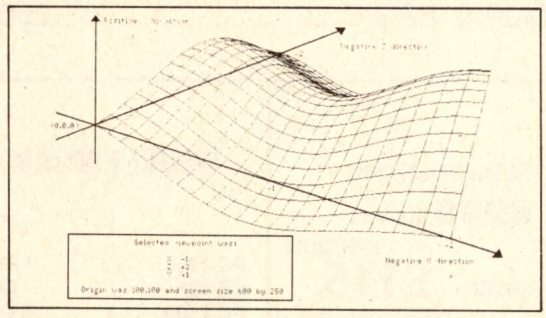
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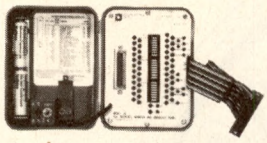
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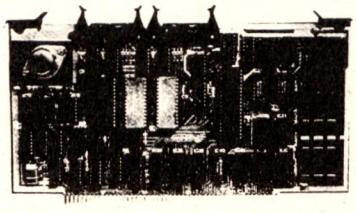
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BENCHTEST

Sharp MZ-700

First launched in Japan back in October 1982 as part of the MZ-700 series, the MZ-711 by the time of its unveiling in the UK had incorporated all the embellishments of the complete range. Surya assesses Sharp's most recent development in the home computer field.



Sharp has taken a strange route to arrive at its latest machine, the MZ-700. First came the MZ-80K. This was a PET look-alike, and survived for a surprisingly long time considering the extremely limited graphics and that incredible 'block' keyboard. After a couple of business machines and a pocket computer, Sharp attempted to replace the 'K' with the MZ-80A.

The MZ-80A had 48k RAM (unexpandable) and sold at £550. The combination of unexpandable memory, MZ-80K graphics and the price tag meant that the machine perched uncomfortably between the top end of the home market price-wise, and the bottom of the business market feature-wise. To date, it appears to have made little impact on either market, other than to ex-'K' owners who appreciate the upward-compatibility.

The MZ-700 is aimed squarely at the home market. Priced at £250, it appears tc be a hybrid machine: clearly retaining its MZ-80K roots, but with some of the improved features of the MZ-80A.

One of the first things to sort out is the confusion over the name of the machine. It was launched in Japan (October 1982) as the MZ-700 series. This series comprised four machines—the 710, 711, 721 and 731. The 710 is the unadorned machine; the 711 has an RF signal jack (for TV use) and a composite signal output (for composite video monitors); the 721 a built-in cassette unit; and the 731 a built-in plotter/printer. I asked a Sharp spokesman if he could explain the rationale behind all these model names, but it appears that there isn't one. I did also wonder about the bottom-of-the-range machine running only on an RGB monitor, and Sharp couldn't come up with an ex-

planation for this either.

Anyway, someone at Sharp evidently decided that this strategy was unnecessarily complicated. When the machine was launched in the UK (September 1983) only the 711 was sold; the cassette unit and printer were sold as separate peripherals, and the 710 disappeared into obscurity. Since the four different names were no longer required, Sharp simply called it the MZ-700. The manual, however, still refers to the four machines. I'm going to call it the 700 from now on.

Like it predecessors, the 700 is what Sharp refers to as 'clean'. This means that there is no high-level language on-board in ROM form. High-level languages are loaded either from cassette or disk, but more about this later.

Hardware

The review machine had the built-in cassette unit and printer/plotter included (making it the equivalent of an MZ-731). The machine measures 44 x 31 x 9cm and weighs 3.6kg without cassette unit and printer, 4.6kg with both.

Styling is somewhat ungainly. Lots of sharp (sorry!) angles and an odd colour scheme: black and white with beige function keys and blue user-definable keys.

Keyboard

The keyboard has 69 keys laid out in a standard configuration. The INS and DEL keys, familiar to Sharp owners, are in their usual place at the top right hand corner, and below them are four cursor keys, sensibly positioned in a diamond shape. Five user-definable function keys sit above the main keyboard on the left. There is a space, protected by a transparent plastic cover, to place the sticky labels supplied with the machine to identify the functions.

The qwerty keys have graphics symbols printed on the underside. These are utilised by pressing the GRAPH key; pressing ALPHA restores the keyboard to alphanumeric use.

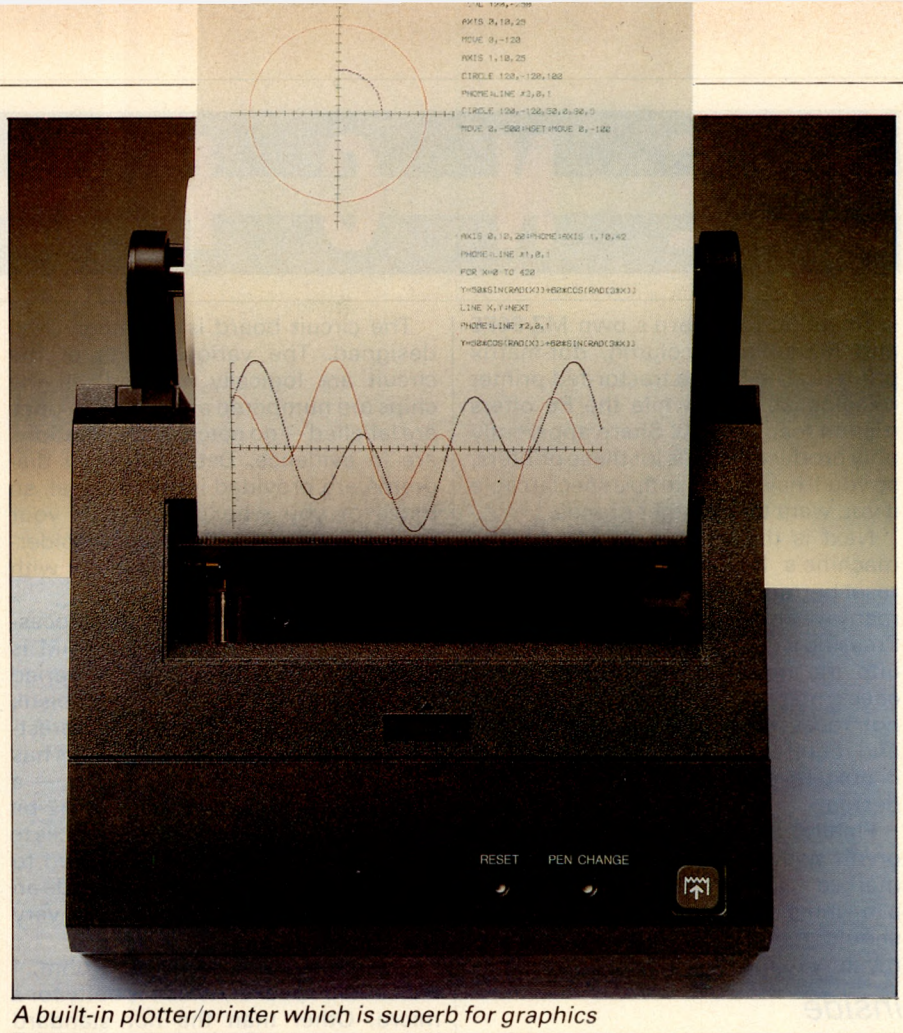
The keyboard feel is a little 'spongy', but I encountered no problems with it.

My only real complaint about the keyboard is that unshifted letters generate upper-case while shifted letters generate lower-case. This was obviously done because S-Basic rejects lower-case commands and statements with a syntax error, but a far more sensible arrangement would have been either to have produced a Basic which ignored case, or to have fitted a CAPS LOCK key. As it is, entering text in PRINT statements is very tedious.

All keys auto-repeat.

Interfaces

Sharp is notorious for providing non-standard interfaces, and the 700 is no exception. There is no RS232 port, and the parallel printer port is of a design unique to Sharp.



A built-in plotter/printer which is superb for graphics



The purpose-designed cassette recorder is an optional extra at £50

All the interfaces are at the back of the machine. Moving from left to right, the 700 has sockets for three forms of video output: a standard TV signal, composite video output and RGB video output. The RGB and TV signals can be switched between monochrome and colour, but the composite video line is monochrome only. A TV lead is the only one supplied with the machine.

Below the video output sockets are the external tape sockets, marked READ and WRITE. These are standard 3.5mm jack sockets; no 'remote' facility is available. Next to these sockets are the joystick interfaces. The joysticks are available at the time of writing (£15), but as yet there is no software to support them.

The I/O bus and the printer port to the right of these are covered by thin metal plates. These are removed by undoing two crosshead screws. The printer port

is intended for Sharp's own MZ-80P5 and MZ-80P6 80-column, dot-matrix printers. The P5 is a tractor-fed printer retailing at £350, while the P6 offers friction feed at £400. Sharp apparently only produces cables for these printers, so you'll have to make up a special cable it you want to use other brands.

Next is the volume control for the machine's built-in speaker, and the reset button. Unlike the reset switch on many machines, this one is dangerous! Pressing it drops you unceremoniously into the monitor — no warning, no check, no program. Since the button is not recessed or otherwise protected and requires only a light touch, putting it next to the volume control is bad design.

Finally, there is the power socket, on/off switch and an earth connection marked FG (Frame Ground). Quite why a machine of this sort of size and power should require a frame ground is a mystery to me.

Inside

Getting into the machine is no mean feat. Three screws must be removed from underneath the front of the machine. Next, the cassette unit and printer and/or dummy boxes must be removed, together with the clips holding them in place. I found the connections from the printer and cassette unit to the circuit board very difficult to pull out without damaging either the connector or the board. Following this, the cover has to be levered off with a screwdriver, or similar. The keyboard is then lifted out and you can — at last! — get at the circuit board.

The circuit board is extremely well designed. The various parts of the circuit are logically situated, all the chips are numbered and the main ones are labelled — no patches or alterations are in evidence. Detailed circuit diagrams are provided in the manual, so those of you who do most of your programming with the aid of a soldering iron will have little difficulty with this machine.

The CPU is a Z80A, and the processor's full complement of 64k RAM is on-board. The chips are a varied assortment of Sharp, Mitsubishi, Toshiba, NEC and others. An interesting chip is the video processor; this has pins extending from all four sides — a technique being used on new 32-bit CPUs to avoid the necessity for tracks to 'jump' each other. I was surprised to find this design of chip lurking inside an 8-bit home micro, but it is a very sensible idea.

The built-in speaker is an 8 ohm, 1 watt audio speaker, which is hefty for a micro. Other than the non-standard printer port mentioned earlier, the rest of the circuitry is much as you'd find in any Z80-based micro.

Data recorder

The 'date recorder' (cassette recorder to you and me), is an optional extra costing £50. The primary advantage of buying this cassette unit in preference to any other is that of reliability. Since the unit is wired directly into the main circuit board via a pin-connector and is purpose-designed, you shouldn't experience any problems loading and saving programs. The unit proved 100% reliable during this review, which is certainly not the case with all the machines we test.

Installing the data recorder is a straightforward if slightly fiddly job. The dummy box occupying the space reserved for the cassette unit is removed by undoing two screws. The plastic socket attached to the data recorder by a narrow ribbon cable is then fitted onto the 9-pin plug on the circuit board. The switch just behind the 9-pin plug should then be reversed, to tell the 700 that the data recorder is installed. The external cassette connections are disabled by this switch.

Finally, the data recorder is lined up and held in place with the screws previously used to hold the dummy box, and is ready for use.

I've always liked the cassette-handling on the MZ-80K, and the 700 is the same. When you type LOAD, the computer checks whether the Play button on the cassette unit is depressed. If not, it responds with a little downward-pointing arrow and the message 'PLAY'. If you type SAVE and the Record and Play buttons are not depressed, it responds with the same arrow and the words 'RECORD.PLAY'.

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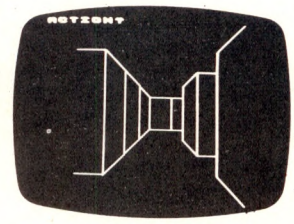
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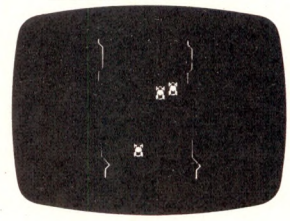
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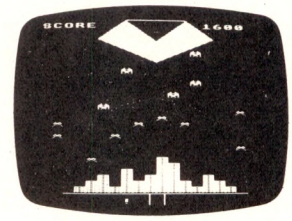
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appears in various cases under various names. I own one myself (in a Tandy case) and, since I paid the full retail price for it, I don't have any ulterior motive for stating that I think it's an amazing little machine. In its Sharp guise, it's an optional extra costing £135.

Since the paper width is a fraction under 11.5cm, it's obviously quite useless for word processing (though I receive a fair few programs accompanied by letters written on it!). However, it is quite adequate for listings, and superb for graphics.

Although described as a printer/plotter, it can't actually print at all: it's a plotter which has been taught to write. The device has four pens in a cylindrical holder that moves horizontally across the roll of paper. Vertical movement is achieved by scrolling the paper. To change colour, the pen holder is rotated to select a different pen.

In text mode, letters are quite literally drawn onto the paper. This is painfully slow (approximately 10cps), but the effect is of very neat, hand-drawn letters. Since everything is drawn rather than printed, text can be any size from 80 characters/column right up to a single character/column. Unfortunately, Sharp does not appear to have given software support to this particular feature of the printer, S-Basic restricting you to one of three sizes. Text can be printed sideways, or even upside down. All the parameters (size, pen colour, direction) are under software control.

In graphics mode, the plotter has its own set of commands quite independent of those used for screen graphics. A set of control-codes and statements added to S-Basic is used for this purpose.

The procedure for fitting the plotter is almost identical to that for the data-recorder, and is well-documented in the manual. A switch is used to select plotter or external printer.

Software

The MZ-700 is supplied with a cassette containing Sharp MZ-700 Basic Version 1.0A (S-Basic). This is upward compatible with Sharp Basic SP-5025 supplied with the MZ-80K. The 700 will also run Basic SP-5025, together with any other Basics and high-level languages written for the MZ-80K. Both facts mean there is a large stock of software available which will run on the machine even before people get around to producing software specifically for the 700.

Unlike the MZ-80K, the 700 does support colour — eight foreground and eight background colours. Glancing through the manual and/or reading the promotional material, an innocent could be deceived into believing that the 700 also supports full colour high resolution graphics. It doesn't. It supports the same pseudo-graphics (that is, block graphic characters) as the MZ-80K, except that you can print them in whatever colour and on whatever colour background you choose, together with low resolution (80 x 50) Set and Reset.

On playing with the COLOR statement, used to change foreground and background display colours, I discovered what appeared to be a major bug in the review machine.

I wrote a little program to step through every possible combination of fore- and background colours, pausing between each. When attempting to display certain combinations of colours (or shades of grey, since I was using a composite video monitor), the display went haywire — the screen 'scrolled' upwards incontrollably, and could only be stopped by switching to a different combination.

A great many combinations appeared to cause this problem. Whether this is something which afflicts all 700s or just applied to the machine I had for review, I don't know. I suggest prospective purchasers ask their dealer to run the following program to find out:-

```
100 FOR A=0 TO 7
120   FOR B=0 TO 7
140     IF A=B THEN NEXT B
160     REM — If foreground = background, skip this combination
180     COLOR,,A,B
200     CLS
220     PRINT"COLOR,,";A;",";B
240     GET A$:IF A$="" THEN200
260   NEXT B
280 NEXT A
300 PRINT"END":END
```

Pressing the space bar (or any key) will step through each of the different combinations of colours. If the display remains steady and clear throughout, there are no problems with the machine.

The reason the unsuspecting could be deceived into thinking the machine supports high resolution graphics is that the colour plotter does. You can achieve some quite detailed and attractive designs on the plotter — as one of the supplied demonstration programs illustrates; what you can't do is produce high resolution graphics on the screen.

The 700 has five user-definable function keys. These are programmed in more-or-less Microsoft standard format: 'DEF KEY (n)="string"', where n is the function key number and string is the statement assigned to the key. Use of the Shift key gives access to another five function keys, making ten in all. So SHIFTed F1 is interpreted as F6 and so on. This may have been a last-minute addition to the interpreter, since the function keys do not have the F6 to F10 markings on the underside of the keys — the method used on the rest of the keyboard to represent the SHIFTed function.

Aside from the colour statements and those used to control the plotter, S-Basic differs little from Basic SP-5025. It is as I have come to expect from Sharp: adequate and unexciting. I had hoped it might have made at least a token attempt at some semblance of structure — a REPEAT-UNTIL or WHILE-WEND loop, if not user-defined functions and procedures. Sharp, it seems, is not an advocate of structured Basic, but I have seen far worse Basics.

Of course, the beauty of a 'clean' machine is that if you don't like the interpreter supplied, no problem: just throw it away and buy another one. The MZ-80K inspired software houses to produce endless dialects of Basic, together with versions of Forth, Pascal and almost any other language you care to name. All of these will run on the 700, and I'll offer you very good odds that the same software houses will see the extra money of the 700 as an opportunity to produce better versions of their existing interpreters especially for the machine.

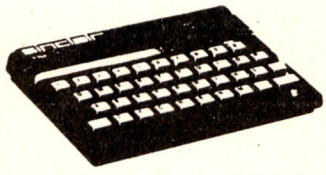
Having to load an interpreter before you can write or run a program can be irritating on a cassette-based machine, since the process is a relatively lengthy one (S-Basic, for example, takes just under three and a half minutes to load). But some would argue that a few minutes delay is a small price to pay for the freedom to choose the language most suited to your current application. And you have only to look at the mess some companies (I'll mention no names) get into when they try to

Benchmarks

BM1	0.4
BM2	3.5
BM3	9.5
BM4	8.6
BM5	9.4
BM6	17.7
BM7	32.7
BM8	82.7
Average	20.6

All timings in seconds. For a listing of the Benchmark programs see 'Direct Access'.

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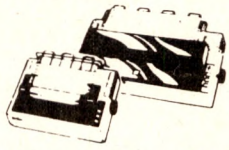
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When it comes to editing, most manufacturers still appear to be living in the age of teletypes, when the only way to tell the (distant) computer what you wanted to edit was to specify the line number. Now that most of us work with these new-fangled VDUs, there really is no excuse for forcing people to edit in this incredibly tedious way.

Sharp provided a full-screen editor even on the MZ-80K, which was launched not so very long after the teletype days, and the 700 has the same sensible, easy to use editor.

PCW Benchtesters get a pretty good idea of how good an editor the machine supports when they come to run the Benchmark programs. Since each program is a modification of the previous one, a good editor should allow the appropriate change to be made quickly and easily. In the case of the 700, the combination of the full screen editor and the RENUMber command made the whole process extremely simple. The Sharp editor is a delight to use.

PLOT ON mode

The statement MODE TH (CR) (to place the plotter in 40-column mode) followed by PLOT ON (CR) instructs the machine to echo all screen output to the plotter. Provided you have the plotter, therefore, it is conceivably possible to use the 700 without a TV or monitor—at a push. Sharp tells me that some people in Japan are using the machine as a 'semi-portable' in this way. It does work, but at 10cps I think you'd have to be very patient to use the machine in this way for any length of time! PLOT OFF switches it off again.

Documentation

The MZ-700 Owner's Manual is a smartly presented 200-page, A4 book. The manual doesn't seem to have decided whether it's a beginners' tutorial or a reference handbook for experienced users. My feeling was that it hovered rather uneasily between the two and didn't quite succeed as either.

The documentation is thorough — right down to the circuit diagrams mentioned earlier — but the explanations read awkwardly. Perhaps Sharp has taken all those comments about literal translations from the Japanese a little too much to heart: the grammar is painfully correct, to the extent of sounding stilted and antiquated in parts.

Included in the manual is a full assembler listing of the monitor program, together with a summary of the Z80A instruction set. This is not quite as useful as it might have been, since the monitor listing given differs somewhat from the monitor program included in the S-Basic interpreter.

Soak test

I left the review machine running from 10pm one evening to 11.30pm the following day, counting from zero upwards in steps of 0.00000001 (less than original, admittedly, but it kept the machine occupied.) It was still counting away quite happily when I returned, and was only slightly warm with the effort.

Prices

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Sharp MZ-700	250
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MZ-80P5 dot-matrix printer	350
MZ-80P6 dot-matrix printer with friction-feed	400

All prices include VAT

Conclusions

I have three main complaints about the Sharp MZ-700.

The first concerns the graphics. A more charitable reviewer might describe the resolution as medium rather than low, but whichever word you use, the MZ-700 doesn't offer anything like the resolution found on most machines in this price bracket. The graphics statements are crude, even when compared to machines selling at half the price—I would certainly have expected sprites.

My second complaint concerns the keyboard. If there is a way of persuading unshifted keys to return lower-case letters, it is not mentioned in the manual — it is extremely annoying having to hold down the shift key when entering text into PRINT and DATA statements.

And thirdly, S-Basic is remarkably unremarkable. You can choose from any one of dozens of other Basics produced for the MZ-80K, but these won't support all the features of the 700. I feel that the software doesn't do justice to the hardware.

These points made, I was generally impressed by the machine. It has a solid, dependable feel about it; I didn't feel I had to make any concessions to its mortality, unlike some machines which virtually demand that you treat them like bone china.

Given the limited graphics, you can't produce the sort of flashy programs which are possible on a Spectrum or BBC, but Sharp machines have traditionally been used more for practical applications than for 'zap-bang' type games.

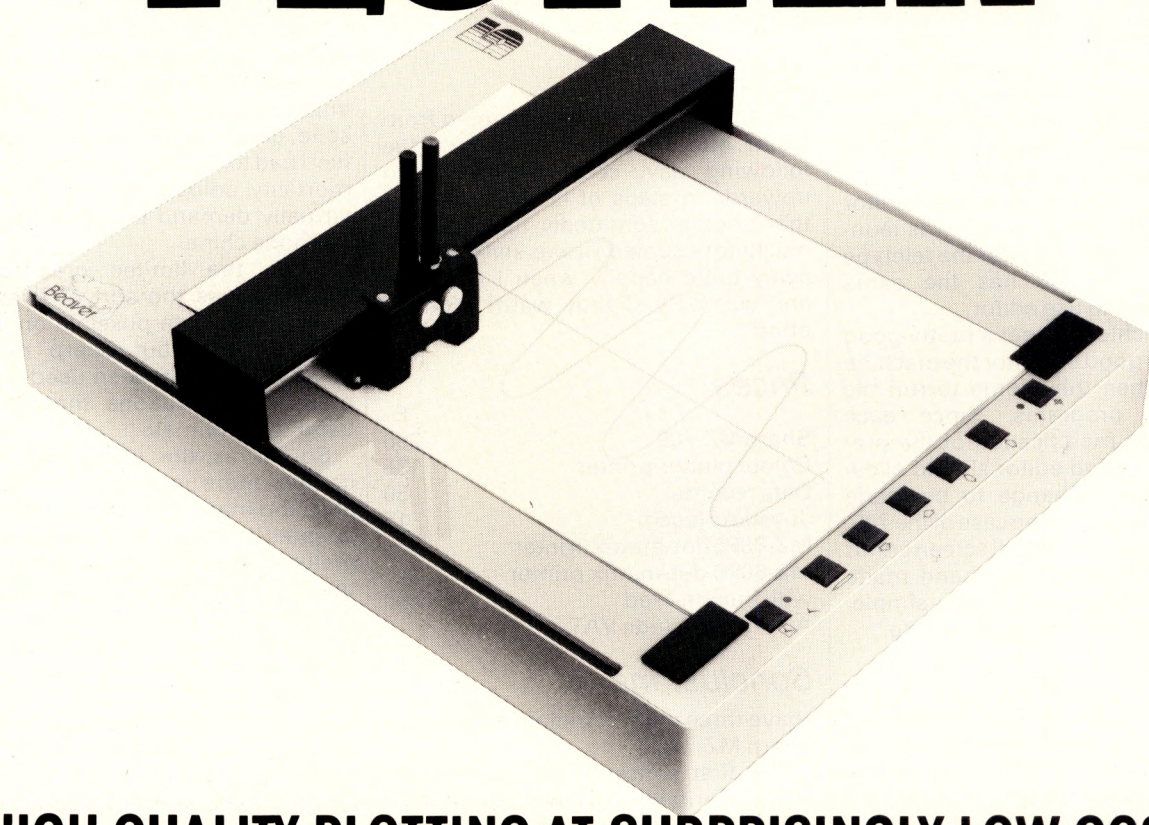
So far as the interpreter is concerned, there is a wide choice available and many of these are likely to be adapted to make full use of the 700's features. Most of the interpreters for the MZ-80K sell at a price which makes it possible to buy them either out of pure intellectual interest, or simply to experiment with a number of languages to find the one which best suits you. This choice means that the quality of the supplied Basic is nowhere near as important as it would be on a ROM interpreter machine. I'd probably throw S-Basic away and buy one of the Pascal interpreters available for the 'K'.

At present, the MZ-700 is virtually the only home micro to offer such a wide range of languages, and is worth considering for this reason alone. I enjoyed reviewing the machine and will continue to use it. Not having had the chance to experiment on any other 700s, I do recommend that you check the display using the program given above. But assuming this was just a fault in the review machine, the Sharp MZ-700 is worthy of serious consideration. END

Technical specifications

Processor	Z80A running at 3.5MHz
ROM	6k
RAM	64k (including memory used by interpreter)
Keyboard	69 keys, ASCII
Video output	PAL (TV), composite video, RGB
Screen resolution	40x25 text, 50x80 graphics, 8 fore- and 8 background colours
Clock	Built-in 24-hour clock without battery back-up
Colour plotter/printer	Four colours, 80-column, 115 ASCII characters, approx 10cps
Data recorder	Standard compact cassette, 1200 baud, Sharp PWM standard

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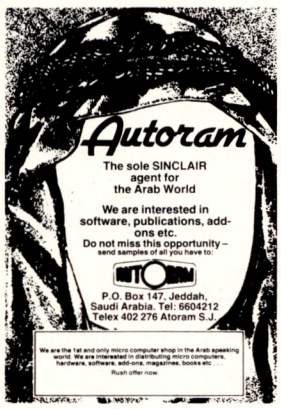
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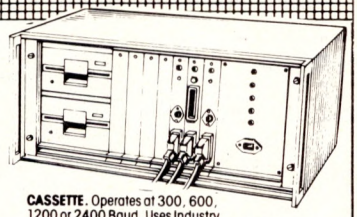
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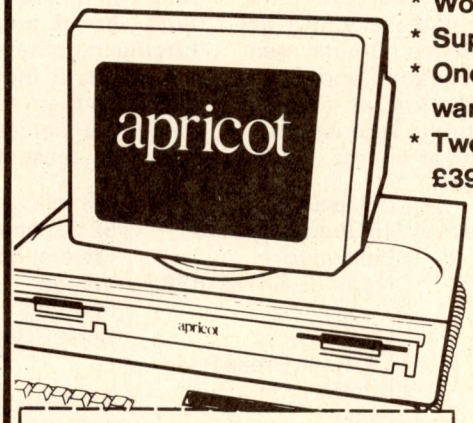
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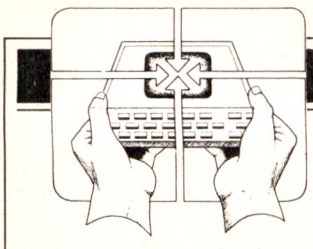
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COMPUTER TOWN UK! NEWS

Margaret Spooner brings you the latest news on Computer Towns.

Voluntary organisations often have problems keeping going after being set up with much enthusiasm. CTUK! seems to be no exception judging by the response I received to a brief questionnaire about Computer Town activities circulated to all groups on the CTUK! Contacts list. Few Computer Towns replied and of these quite a few were no longer active. Others mentioned falling attendance and fewer enquiries. Ted Ellerton at Palmers Green suggested this is because of the greater availability of micros, TV information programmes and use of computers in schools. Some of the Computer Towns have formed computer clubs. Once initiates have learnt the fundamentals of computing and wish to progress to more advanced topics a club for computing enthusiasts is a more appropriate meeting place for them.

Computer Towns rely heavily on the good will of knowledgeable computer buffs who are prepared to spend time introducing others to the mysteries of computers. If the one or two people who give their time in this way are suddenly unable to do so the Computer Town may cease. This has happened in Billingham but Ray Skinner hopes its activities have only ceased temporarily. He appeals to anyone living in the Billingham area, willing to support the Computer Town, to bring a machine to meetings or help in some other way. You can contact him at 22 Colsterdale Close, High Grange, Billingham, Cleveland, tel: (0642) 522486 (evenings).

The active Computer Towns have had any number from ten to 100 newcomers at meetings in the past year and some have stayed on to help in their activities.

A list of UK Computer Towns is given below for reference.

R Shipton
17 Woodlands Avenue
Eastcote
Ruislip
Middx

John Mileham
RACS
147 Powis Street
London SE18 6JN

Mike Sones
Gayton Library
Gayton Road
Harrow
Middx

Ted Ellerton
25 Beachdale
Winchmore Hill
London N21

Bill Gibbings
2 Longholme Road
Retford
Notts DN22 6TU

Peter J Kiff
2 Ranelagh Grove
St Peter's in Thanet
Broadstairs
Kent CT10 2TE

Peter Stone or
P Strangman
Computing and Maths
Dept
The Polytechnic
Wulfruna Street
Wolverhampton
WV1 1LY

J M A Kilburn
(Headmaster)
Shawfield Norden
Community Middle
School
Shawfield Lane
Norden
Rochdale L12 7QR

Tony Cartmell
54 Foregate Street
Worcester WR1 1DX

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15 Queens Square
Eastwood
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Philip Joy
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Derrick Daines
18 Cuttings Avenue
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Notts

John Stephen Bone
2 Claremont Place
Gateshead
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Bob Carter
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Ashford Main Library
Church Road
Ashford
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Chilworth
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110 Church Road
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Patrick Colley
52 Queensway
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Richard Powell
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Peter Earthy
46 High Street
Church Stretton
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Alan Sutcliffe
4 Binfield Road
Wokingham
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Alan Potten
14 Foxmede
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Keith Taylor
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Alan Hooley
21 Brammay Drive
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Ray Skinner
22 Colsterdale Close
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Billingham
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Computer Town UK! is a rapidly expanding network of computer literacy centres where members of the public are given free access to all sorts of computer equipment. This is courtesy of those willing to offer time/resources. You can find a Computer Town anywhere — they're often in libraries or schools. The aim is to make micros enjoyable and non-threatening, so axe-grinding of any sort is banned. Guidelines are available for those interested in starting up their own 'Towns. Write to: Margaret Spooner, Computer Town UK!, PCW, 62 Oxford Street, London W1A 2HG. Remember to enclose an A4 SAE for your reply. Please don't ring for information as Computer Town UK! is entirely a spare time activity.

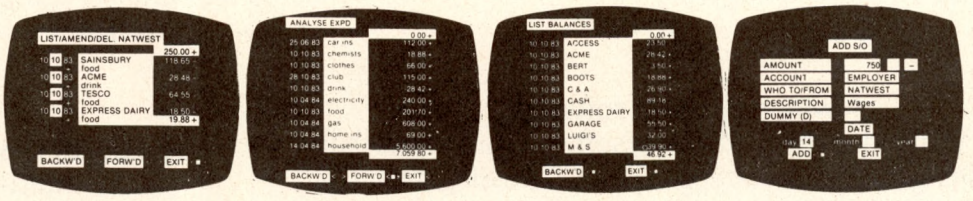
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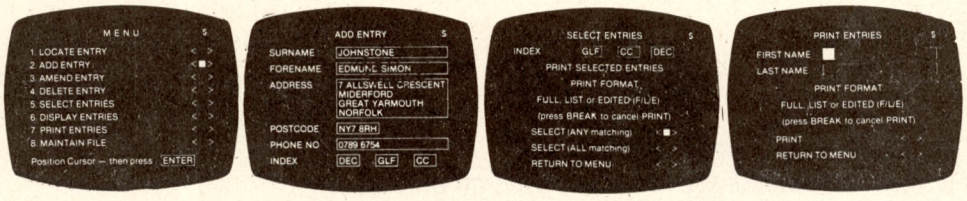


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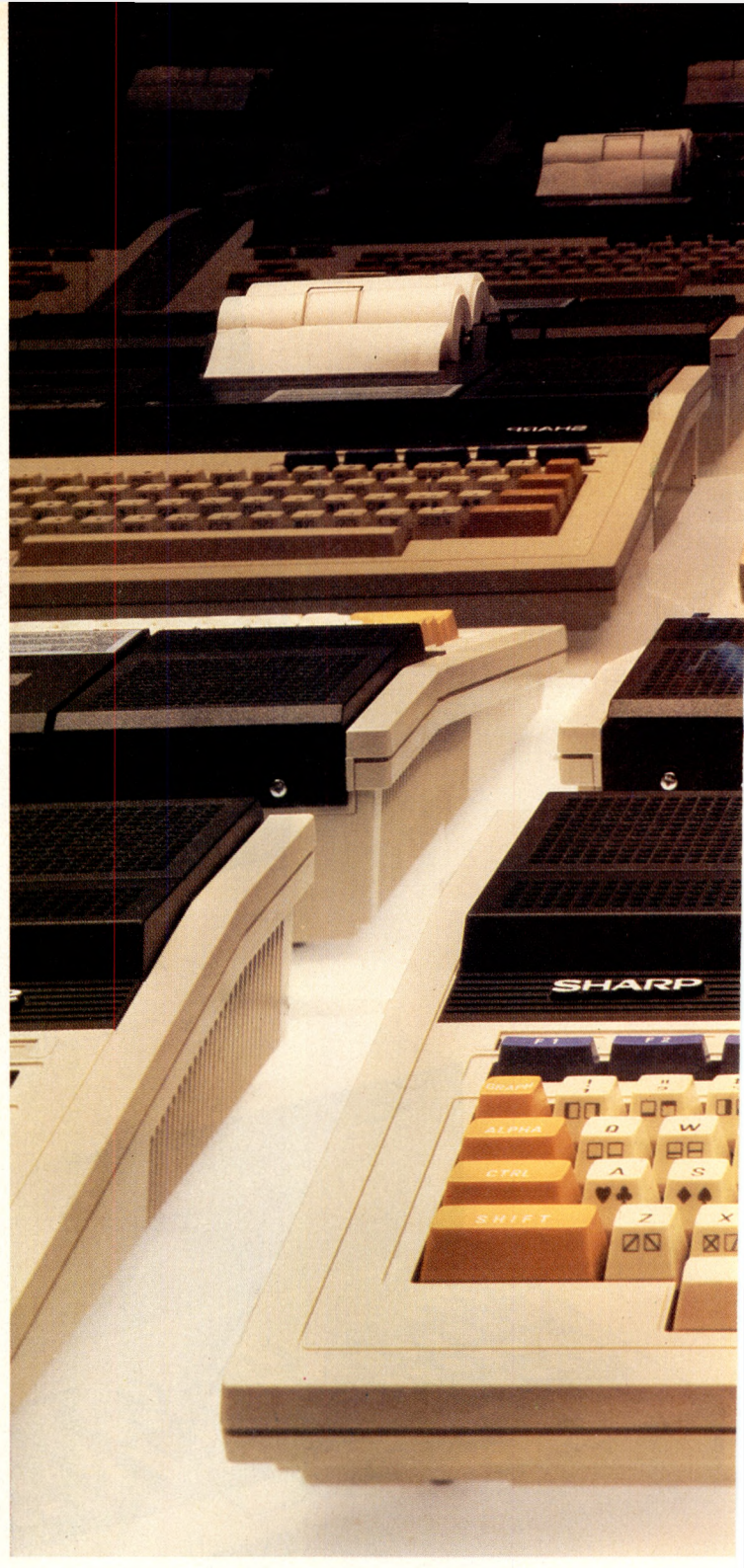
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If you've been wondering whether you would ever learn to program in assembly language . . . if you've picked up a teach yourself book and been blinded by science . . . if you've wished you could join the other *PCW* readers for whom Subset is a monthly treasure trove . . . then today is your red-letter day. Each article will deal with a digestible section of assembler and will contain a piece of code for you to type in and run: to do this you will need an assembler program. You can buy one for your computer from a software dealer. Our series will contain details for computers using the Intel 8080, the Zilog Z80 or the MOS 6502 processors, but if your machine doesn't happen to be based on one of these, don't despair. Throughout the series emphasis will be placed on the programming structures used, so you should be able to implement the example programs using the instruction set appropriate to your computer's processor.

What is an assembly language?

Your first question may be . . . What is an assembly language anyway? The language a microprocessor understands—machine language—is that of binary numbers. For example, the binary number 11000011, (a jump instruction in the language of one processor), is rather like a GOTO in Basic. The difference is that a memory location instead of a Basic line-number is targeted. It's possible to program a computer using these codes, or using hexadecimal numbers in their place, but the moment you use any system other than binary, the computer cannot recognise the instruction. Instructions need to be converted into binary, either by hand or using the computer itself, before the processor can act on them.

Hexadecimal numbers are almost as incomprehensible to humans as are binary ones: would it matter to you whether you had to use 11000011 or C3 instead of a word like GOTO? There is certainly a difference, and early on in the development of the computer it became clear that to write even moderately sized programs in binary, hexadecimal ('hex') or octal was a masochistic activity. So a language was created that used operations identical to those the computer could perform, but which was easier for humans to understand. That's how assembly language programming was born. The names given to the instructions are mnemonics (a word meaning 'memory jogger'). The mnemonic for the 11000011 instruction is JMP, which is a useful improvement.

Hexadecimal numbers

You'll still need to manipulate some hexadecimal numbers as memory locations. Don't panic! You probably already use hexadecimal counting unconsciously. When you add pounds and ounces, you add the ounces first: if they come to more than 16 you carry the number of multiples of 16 into the pounds column, for example:

2lbs 14 ounces
+
2lbs 5 ounces

5lbs 3 ounces
(14+5=19 which is 'one of 16' and '3 oz left over')

If, instead of using numbers from 0 to 15 for ounces we used 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F, we could then write 2lbs 14oz as 2E and so on. This extended numbering system forms the basis of the hexadecimal notation. If you now consider the eight bits of a byte of binary information as two groups of four bits, you will appreciate that we can represent each of those groups by a hexadecimal digit. So, with binary number 10001111.

1000 Binary=8 Decimal=8 Hex
1111 Binary=15 Decimal=F Hex,

so 10001111 binary can be written very compactly as 8F hex. An eight bit binary number can take values from 0 to 255, that is, from 00000000 binary to 11111111 binary. Only two characters are needed to express the same range in hexadecimal notation! In a similar fashion, we can represent two bytes (16 bits) of information by using four hex digits: try writing 1111000010001111 in hex yourself. Most assemblers expect memory locations to be provided as hexadecimal numbers.

Standard mnemonics

The choice of mnemonics to be used with a particular processor is arbitrary, and the selection is made and recommended by the people who make the chip in question. If you think in terms of Basic, you may have realised that different software houses write their Basic interpreters and compilers around various standard facilities, but still end up producing slightly different versions of Basic. If you compare the Basic keywords for the Spectrum with those for the BBC you'll see the difference. That's why you need the *PCW* converter chart when you want that wizard ZX81 program of Uncle Arthur's to run on your Oric. Manufacturers of microprocessors also design differently, so that each type has its own characteristics and methods of implementing the functions it provides, thus its own set of mnemonics. For this reason, the mnemonics you use will depend on the chip around which your computer is built.

In this series we deal with three chips, the Intel 8080, the Zilog Z80 and the MOS 6502. The Z80 is used, for example, in Sinclair machines, MZ-80K, and NewBrain; the 6502 in the Apple, the BBC and the Pet, to name but a few. The 8080 is included because although getting on in years, it is a useful jumping-off point for some of our explanations. The Rair 'Black Box' is one machine based on this chip. Consult your handbook if you don't know which chip your machine uses.

What is an assembler program?

Having written in assembly language mnemonics, you need to convert your program into binary for the computer to work. The computer program that does this conversion for you is called an assembler. Nowadays, many assembler programs have editing facilities incorporated. This means you can write your assembly language program direct into the computer as you would a Basic program, and the editor will pick you up on your errors. Then, when the program is bug-free, you press a key and the program is 'assembled'. The assembler itself can be on a cassette, like a games program, which you load into your machine.

Each assembler has its own rules, which you will need to be aware of. One of the things you will learn this month is how to use your assembler to get the code in this article into your machine. Have a glance through the documenta-

tion supplied with your assembler before you begin, but don't worry if a lot of it seems like incomprehensible jargon to start with.

A line in an assembly language program can be divided into three regions or 'fields'. These are a label field, an instruction field and a comments field. The first and last are optional. Your assembler will have fixed rules for identifying the individual fields and you'll find these in the documentation provided with it (see Fig 1, example line from an assembly language program).

Comments within the program

You'll probably be familiar with REM statements in Basic. In such a high-level language you can often work out what a program does even if it hasn't been properly documented with a healthy sprinkling of REM statements. The same is not true of assembly language. One of the fundamental differences between high level languages (such as Basic) and assembly language is that the latter is difficult to analyse. This is because any inherent structure is not always obvious in the code, so make the most of a lesson many of us have learnt the hard way and document to the maximum extent, time and your assembler permitting. *The importance of placing understandable comments within an assembly language program cannot be over-emphasised.*

```
CHECK^CHARACTER:   CPI CARRIAGE RETURN      : end of input?
```

Label field (Optional) — Instruction field — Comment field (Optional)

Fig 1 Example line from an assembly language program

Labels

Most assemblers allow you to use meaningful names for specific locations in memory. This means you don't have to remember, for example, that location 0A3F Hex is the start of a subroutine that checks for keyboard input characters. Instead, you may use a label, say CHECK^CHARACTER in the label field of the first instruction of that subroutine. The assembler will add the label to an internal symbol table it maintains, and you can then use the label to reference the routine. (Some assemblers require you to place a delimiter character, often a colon, immediately after a label definition in order that the assembler can distinguish it from the instruction field.

Equate directive

Another facility offered by assemblers enables names to be assigned to numeric values. Since this facility is a function of the assembler rather than the processor, the equate directive is known as a pseudo operation, pseudo-op for short. It is especially useful for defining many of the common ASCII characters.

By placing the following statement at the start of an assembly language program, you cause the assembler to include these definitions in its symbol table.

```
CARRIAGE$RETURN     EQU  13
SPACE               EQU  32
```

Using these definitions will make your programs more readable to yourself . . . and to others.

Other pseudo-ops such as ORG (short for origin) are available: ORG selects whereabouts in memory your program is to start. Having given you an idea of what assembly language is, we'll add to your knowledge of pseudo-ops as and when required.

Operating systems

Before a microprocessor can do anything useful, it needs a means of getting data, somewhere to send its output, additional memory, and a way of coordinating everything that's going on. The routines which perform these and other functions are known collectively as the computer's operating system. Micros that use disk drives for input/output data generally use one of a number of 'soft' operating systems such as CP/M (Control Program for Microcomputers) or MS-DOS (Microsoft Disk Operating System). These are programs which the user needs to load into his machine before any other work is done. Home micros generally have an 'own-brand' operating system resident in read only memory (ROM). Operating systems usually contain accessible routines which you may use in your own programs to simplify many operations. In this series we can't cover *all* the available operating systems, so we'll avoid reference to specific computers. This means that when the time comes, you will have to delve into your computer's manual for certain details you'll need. But by the time we get to that stage you'll have been given sufficient grounding in the general principles to know what you're looking for.

Memory pages

I've already said that it's possible with a two byte address to specify any one memory location out of a total of 64k (64 × 1024=65536) such locations. Such an address can be written in hex form using four digits. An additional concept of dividing available memory into pages, each of 256 locations, has proved useful. The first byte, or high byte, of such an address is often called the page number. Page zero refers to the initial 256 bytes of memory, whose addresses go from 0000 hex to 00FF hex. Structured programming has been made possible thanks to the discovery that virtually all problems can be solved using a combination of three structures, sequence, repetition and alternation.

For our theme this month, let's take repetition — the loop structure. The program we'll use to illustrate it, and to give you your first hands on experience of assembly language programming, is a simple one to collect characters directly from the keyboard and print them on the VDU screen. This program could be written in various ways in Basic. We've chosen a representation that makes for easy comparison with the assembly language equivalent. Figs 2 and 3 contain the flowchart and Warnier diagram for our program.

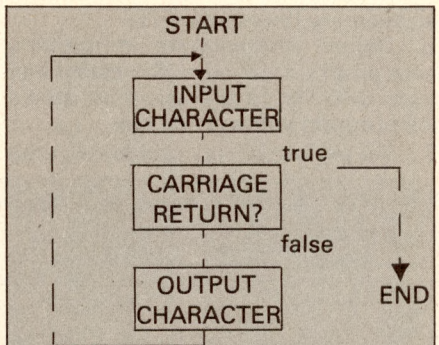


Fig 2 Flowchart for the example program

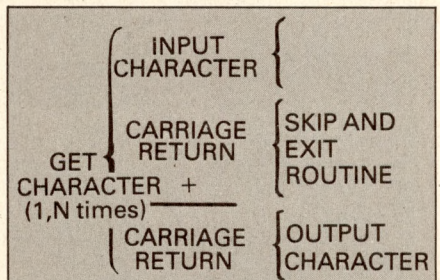


Fig 3 Warnier diagram for the example program

In use

The Basic program can be divided into three parts. An initial or 'set up' block is used to define a variable called CARRIAGE.RETURN$ as the string equivalent of the ASCII 13 carriage return code. The end block is nothing more than a single Basic END statement. The bulk of the program, labelled the main block, performs several functions. The INPUT$() function collects a character. We then check to see if it's a carriage return character, and if it is we jump to the end of the program. Otherwise, we print the character and jump back to the input statement in line 40 for the next character. An example of the basic form can be seen in Fig 5.

When we write an equivalent program in assembly language we use the same type of program structure. The set up block will, however, vary according to your processor, assembler and

operating system. We give three examples of the kind of coding that could be expected. First we shall deal with the 8080 form:

8080 MNEMONICS FOR THE SET UP BLOCK

```
CARRIAGE$RETURN     EQU   13
                    ORG   100H
                    JMP   STACK
                    ORG   150H
STACK:              LXI   S,P,$-2
```

Operations used

1. Define CARRIAGE$RETURN so that the assembler will recognise this term as meaning the number 13.
2. Define whereabouts in memory your program is to start. Our assembler uses ORG, so in the example above the program starts at 100 hex.
3. We perform an unconditional jump to an address labelled STACK. A stack is an area of memory which is used to store items the processor will need from time to time. It's called a stack because items are added to it and taken from it in the same way you would take and add cards to and from the top of a pack of playing cards on the last in, first out basis. Each of the three processors we are describing has a stack pointer register to determine the memory location currently at the top of the stack. Instructions for placing items on top of the stack automatically adjust the stack pointer accordingly. We'll be using the stack often, and will deal with its other uses as appropriate. It is common practice to talk of the placing of data on the stack as 'pushing' onto the stack. When items are removed the terms popping or pulling are used.

A register is a place within a processor that can hold binary information. With eight bit processors we talk of an eight bit word length, and this, as you probably know, is called a 'byte'. 8 bit registers in our processors can therefore hold one byte of information.

Eight bit processors usually provide some means of combining pairs of their eight bit registers in order that a 16 bit (two byte) memory address can be specified. This is vital if we are to be able to 'address by name' all the memory locations in the 0 to 64k range. In fact, certain memory addressing instructions enable less than the full address to be given and this can have advantages in terms of speed of operation.

Since we've digressed, lets complete our digression by looking at a schematic layout of the 8080 processor (Fig 4). The 'Accumulator' is a straightforward 8 bit register, and is used, often implicitly, for all data I/O and arithmetic/Boolean operations. Many instructions apply specifically to this register.

Six 'Secondary Registers' are shown. Each can be used as an individual 8 bit register, but it's possible to pair B,C...D,E..and H,L to create effective 16 bit registers.

You'll also notice a set of 'Flags'. Flags are a group of bits which collectively can be referred to as a status word or program status word. These bits are affected by the occurrence of certain conditions: for example, any arithmetic operation that results in zero being present in the accumulator will set the zero flag to 1. (Remember that a bit can only take the value of 0 or 1), and that by convention, 1 is used to represent the 'true' condition.

That's the end of the digression, so back to the code. The unconditional jump we performed (JMP STACK) is the first real assembly language instruction we have encountered. It's called an unconditional jump because it is performed irrespective of any processor flag conditions. The mnemonic JMP represents a three byte instruction. The first byte is the op code, that is, the numerical representation of the mnemonic. The second and third bytes are the address that is specified.

The microprocessor performs this jump by placing the address following the op code into the program counter register, which is the destination register for the information transfer. As the mnemonic JMP uses the two byte address (or a label) as its operand it is said to be able to use the immediate addressing mode.

4. Now we tell the assembler to pass over the space we are reserving for use as a stack. The ORG 150H instruction means the assembler places our next mnemonic at this new origin, leaving half a page of memory for the stack.
5. Lastly, we load the stack pointer register (SP) with the value $-2. This is because our assembler uses '$' to define the address of the current memory location, and is done with the mnemonic LXI, used by the 8080 to place a 16 bit address into a register pair, in this case SP.

Remember to check with your assembler manual whether the pseudo-ops ORG and EQU are achieved using these or different mnemonics.

Z80 MNEMONICS FOR THE SET UP BLOCK

The only difference is the unconditional jump mnemonic which on the Z80 is JP. We again use immediate addressing.

```
CARRIAGE$RETURN     EQU  13
                    ORG  100H
                    JP   STACK
                    ORG  150H
STACK:              LD   SP,$-2
```

```
5  ***************************   REM  SETUPBLOCK  **********
10 CLEAR
20 CARRIAGE.RETURN$=CHR$(13)
22 ***************************   REM  ENDSETUPBLOCK *******
23
24
25 ***************************   REM  MAINBLOCK ************
30 X$=INPUT$(1)                  REM  COLLECT CHARACTER IN X$
40 IF X$=CARRIAGE.RETURN$
   THEN 70 ,                     REM  END OF INPUT IF TRUE
50 PRINT X$                      REM  OUTPUT CHARACTER TO VDU
60 GOTO 30                       REM  GET NEXT CHARACTER
62 ***************************   REM  ENDMAIN BLOCK *********
63
64
65 ***************************   REM  END BLOCK
70 END
72 ***************************   REM  END OF END BLOCK
```

Fig 5 Complete Basic Version

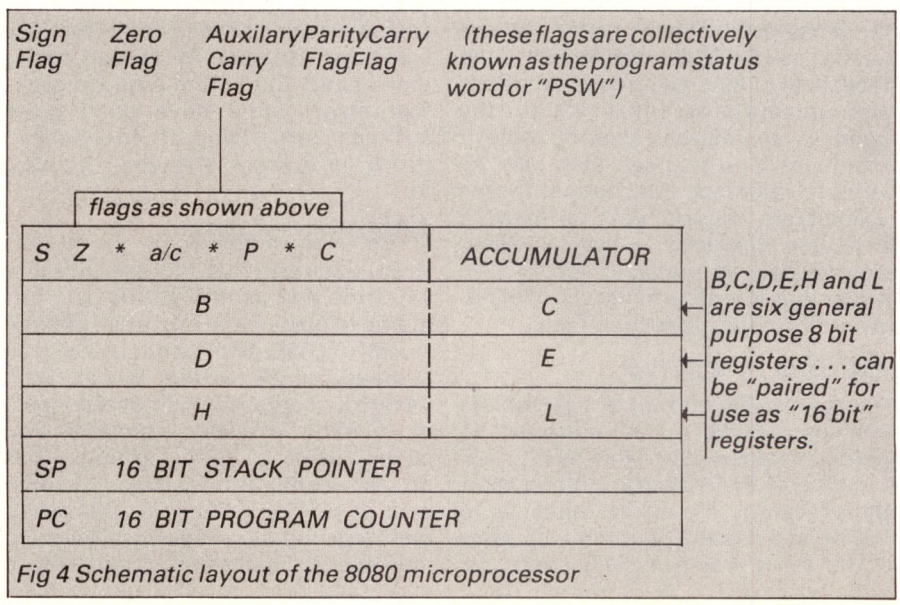


Fig 4 Schematic layout of the 8080 microprocessor

6502 MNEMONICS FOR THE SET UP BLOCK

The 6502 uses page one addresses for the stack. The stack pointer is an eight bit register but using an extra leading bit (implied with a bit of hardware jiggery pokery) the 6502 creates a nine bit address for the stack pointer. So, if you load it with FF hex it will be pointing to memory location 1FF. You can't load the stack pointer register directly on the 6502, so instead you load the X register using mnemonic LDX and then transfer the contents of X to the stack pointer (S) register using TXS. With 6502 systems the stack will have been set up by the operating system, so you will use the existing stack. Typical code for the 6502 set-up block is shown below:

```
CARRIAGE$RETURN     EQU  13
                    OKG  800H
```

We have indicated the general type of set up block usually required. It may be that your particular system requires joint use of the stack and that your programs should simply use an existing stack. In other cases, it is necessary to save the 'operating systems' stack pointer so that it can be reinstated when your program has finished. You must, to a large extent, be guided by your own system requirements.

As you can see in Fig 6, the structure of all three examples of main block coding is identical. We first call INPUT$ROUTINE to collect the character in the accumulator: note that the 6502 mnemonic for a subroutine call is different from the Z80 and the 8080. The address INPUT$ROUTINE is put into the program counter to achieve a jump to the required subroutine. Prior to this the processor's program counter, which points to the next instruction, is automatically pushed onto the stack. When the subroutine ends, this address is popped off the stack and replaced in the program counter, which then points to the instruction after the CALL or JSR instruction.

The next instructions compare the character collected in the accumulator with the value CARRIAGE$RETURN. The processor subtracts the contents of the accumulator from the value of the byte specified (in this case 13). The zero flag is set if the result is zero but the result of the subtraction is not stored anywhere, nor are the contents of the accumulator altered.

Immediately following the comparison test we have used a conditional jump instruction. If the zero flag has been set, a jump to an as yet unspecified FINISH routine will follow.

If the zero flag has *not* been set, instead of jumping to FINISH, a further subroutine call (this time to an output routine) is made. We then jump back to the start of the main block to collect another character.

Let's look at the difference between

8080 MNEMONICS

```
START:  CALL    INPUT$ROUTINE       :collect character in
                                    :accumulator
        CPI     CARRIAGE$RETURN     :end of input if true
        JZ      FINISH
        CALL    OUTPUT$ROUTINE      :output character to VDU
        JMP     START               :get next character
```

Z80 MNEMONICS

```
START:  CALL    INPUT$ROUTINE       :COLLECT CHARACTER in
                                    ;accumulator
        CP      CARRIAGE$RETURN     :end of input if true
        JP      Z, FINISH
        CALL    OUTPUT$ROUTINE      :output character to VDU
        JP      START               :get next character
```

6502 MNEMONICS

```
START:  JSR     INPUT$ROUTINE       :collect character in
                                    :accumulator
        CMP     # CARRIAGE$RETURN   :end of input if true
        BEQ     FINISH
        JSR     OUTPUT$ROUTINE      :output character to VDU
        JMP     START               :get next character
```

Fig 6 Main block coding

FULL LISTING 8080 VERSION

Notes: The operating system we are using requires that you identify the system function needed by placing a 'function number' into the microprocessors C register. It also expects 'output characters' to be in the E register and not the accumulator. This means we have to use instructions to transfer the contents of the accumulator into the E register. We set up the necessary details and then we CALL the operating system through a common entry point which is a jump located at memory location 5. The direct I/0 function used also needs FF hex present in the E register to indicate that imput (rather than output) is required.

SET-UP-BLOCK

```
CARRIAGE$RETURN     EQU     13
OPERATING$SYSTEM    EQU     5
                    ORG     100H
                    JMP     STACK
                    ORG     150H
STACK:              LXI     SP,$-2
```

MAIN BLOCK

```
START:              CALL    INPUT$ROUTINE
                    CPI     CARRIAGE$RETURN
                    JZ      FINISH
                    CALL    OUTPUT$ROUTINE
                    IMP     START
```

END-BLOCK

```
FINISH              JMP     0           ;Reboot operating
                                        system
```

INPUT-ROUTINE

Notes: We have to use a 'wait for input' loop here. With our system it is necessary to preserve registers before using the operating system 'calls'.

```
INPUT$ROUTINE:      PUSH B!PUSH D! PUSH H   Preserve registers
INPUT$ROUTINES1:    MVI     E,0FFH      ;Signifies console
                                        input
                    MVI     C,6         Direct console 1/0
                                        function
                    CALL    OPERATING$SYSTEM
                    CPI     0           ;0= no key preseed
                    JZ      INPUT$ROUTINES1
                    POP H ! POP D ! POP B   ;Restore registers
                    RET
```

OUTPUT-ROUTINE

```
OUTPUT$ROUTINE:     PUSH PSW ! PUSH B ! PUSH D ! PUSH H
                    MOV     E,A         ;transfer is in E reg-
                                        ister
                    MVI     C,2         ;Console output
                                        function
                    CALL    OPERATING$SYTEM
                    POP H ! POP D ! POP B ! POP PSW
                    RET
```

FULL LISTING Z80 VERSION

Notes: See the 8080 notes for details concerning our operating system

```
                    SET-UP-BLOCK
CARRIAGE$RETURN     EQU     13
OPERATING$SYSTEM    EQU     5
                    ORG     100H
                    JP      STACK
                    ORG     150H
STACK:              LD      SP,$-2
                    MAIN-BLOCK
START:              CALL    INPUT$ROUTINE
                    CP      CARRIAGE$RETURN
                    JP      Z,FINISH
                    CALL    OUTPUT$ROUTINE
                    JP      START
                    END-BLOCK
FINISH              JP      0               ;Reboot operating
                                            system
                    INPUT-ROUTINE
Notes: See the 8080 notes for details concerning our operating system
INPUT$ROUTINE:      PUSH B ! PUSH D ! PUSH H    ;Preserve registers
INPUT$ROUTINES1:    LD      E,0FFH          ;Signifies console
                                            input
                    LD      C,6             ;Direct console 1/0
                                            function
                    CALL    OPERATING$SYSTEM
                    CP      0               ;0= no key preseed
                    JP      Z,INPUT$ROUTINE$1
                    POP H ! POP D ! POP B   ;Restore registers
                    RET
                    OUTPUT-ROUTINE
OUTPUT$ROUTINE:     PUSH PSW ! PUSH B ! PUSH D ! PUSH H
                    LD      E,A             ;transfer is in E reg-
                                            ister
                    LD      C,2             ;Console output
                                            function
                    CALL    OPERATING$SYSTEM
                    POP H ! POP D ! POP B! POP PSW
                    RET
```

FULL LISTING 6502 VERSION

```
                    SET-UP-BLOCK
CARRIAGE$RETURN     EQU     13
INPUT$ROUTINE       EQU     FDF0H
OUTPUT$ROUTINE      EQU     FD10H
                    ORG     800H
                    MAIN-BLOCK
START:              JSR     INPUT$ROUTINE
                    CMP     #CARRIAGE$RETURN
                    BEQ     FINISH
                    JSR     OUTPUT$ROUTINE
                    JMP     START
                    END-BLOCK
FINISH              RTS
```

the JZ AND THE JP instructions and the 6502's BEQ. The first two result in jumps to addresses that have been specified by a two byte operand. The 6502, on the other hand, executes a 'branch if equal to zero' instruction, using a form of addressing known as relative addressing. The value of the operand is a one byte displacement, not an address. The branch is limited to values that can be specified in one byte. (Your assembler will calculate the displacement and should tell you if you exceed this limit.)

Relative addressing has the advantage of only requiring a two byte instruction (which makes for faster execution). Since we do not use an absolute address it also means that the code produced is relocatable. The disadvantage is that you are limited to a displacement of +127 to −128 (added to the contents of the program counter). We'll wait until we have examined two's complement arithmetic for a full explanation of this instruction.

To finish your program you will need to look at your machine manual again. Programs operating in a CP/M environment can use a JMP 0 instruction to 'reboot' the operating system. In such a case FINISH would look like this:

```
FINISH: JMP 0       ; Reboot operating system
```

Other systems may expect your program to perform an additional subroutine return instruction. The 8080/Z80 mnemonics for this instruction are both RET; the 6502 uses RTS:

```
FINISH: RET (or RTS for the 6502) ; Return to O/S.
```

Input—output subroutines

Once again you'll be dependent on your operating system: you should find addresses for functions such as direct input and console output. These might be given abbreviations such as GETCHAR, CONIN and OUCH etc. If you can call these functions directly, all you need to do is add the necessary equate definitions into your 'set up' block.

A possible problem

Discovering that your operating system routine returns a zero value to the accumulator if no keyboard character is available, that is, it doesn't 'wait' for input, is a problem. In this case you'll need to create a 'wait for input' loop. The idea is the same for all three processors, so we'll just show the 8080 version:

```
INPUT$ROUTINE:

CALL SYSTEM$INPUT$ROUTINE
CPI 0
JZ INPUT[ROUTINE
RET
; system direct input
; is accumulator 0?
; no input, so wait
```

In this case you would use an equate directive in the set up block to define SYSTEM$INPUT$ROUTINE's address, and then place the above routine into your program. Remember that when you call a subroutine, the address of the next instruction is pushed onto the stack. By making the last instruction of the routine a RET (or RTS is the case of the 6502) that address is popped off the stack and replaced into the program counter. The next instruction to be executed after the subroutine is then the one that followed the subroutine call instruction.

Having explained how our example program operates, it's over to you to put it into practice. Don't undervalue the time you'll spend checking your assembler documentation and computer handbook: it's up to you to become familiar with the information that is there waiting for you to use it. One word of warning: don't get so engrossed in your practical work that you forget to buy next month's *PCW*, when we'll take the next step in your journey into assembly language programming.

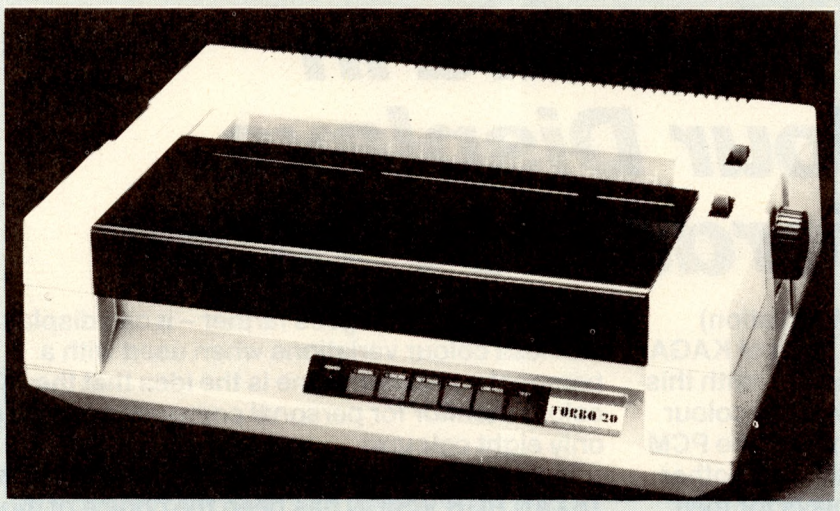
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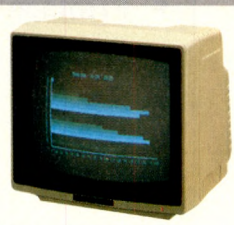
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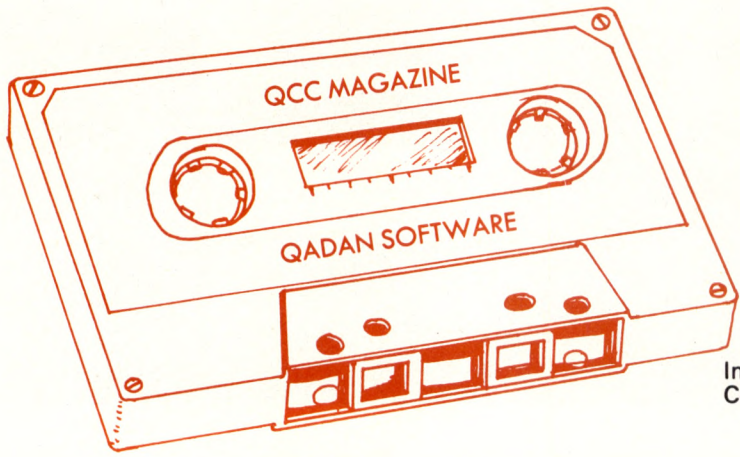
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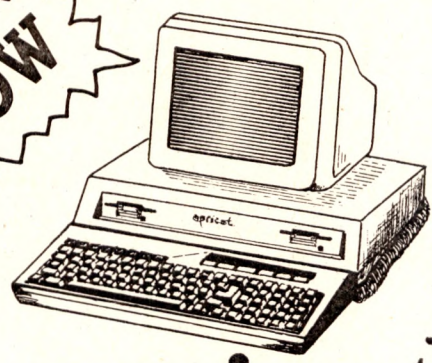
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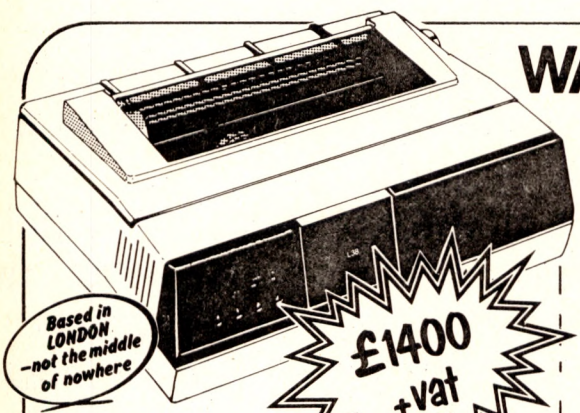
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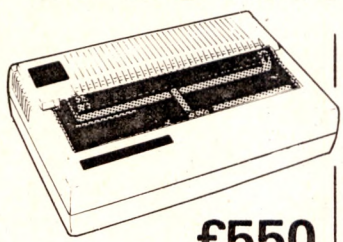
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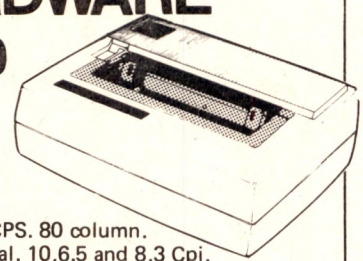
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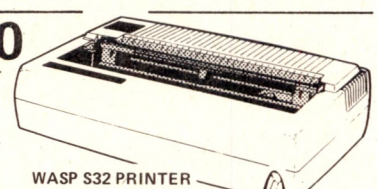
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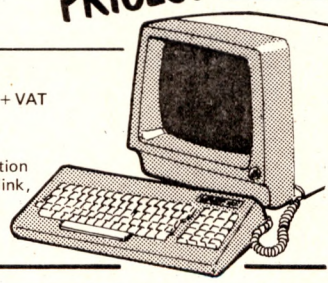


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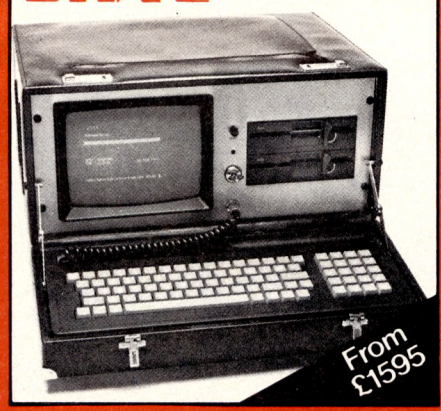
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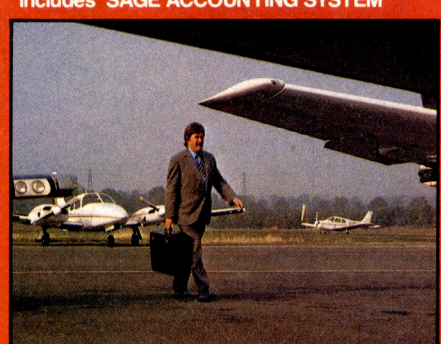
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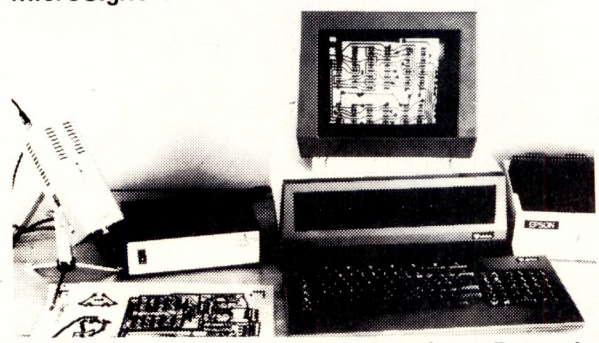
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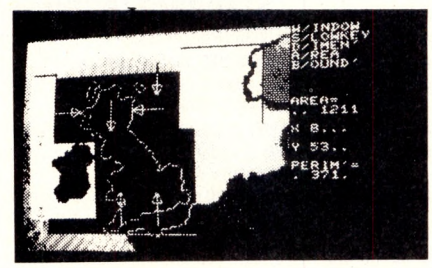
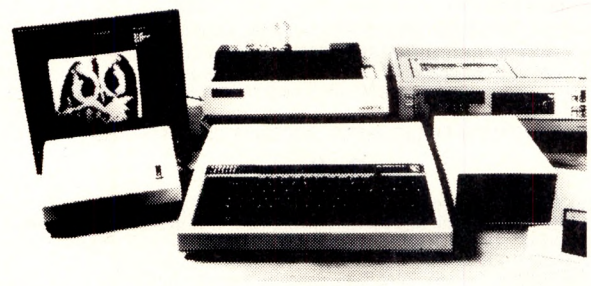


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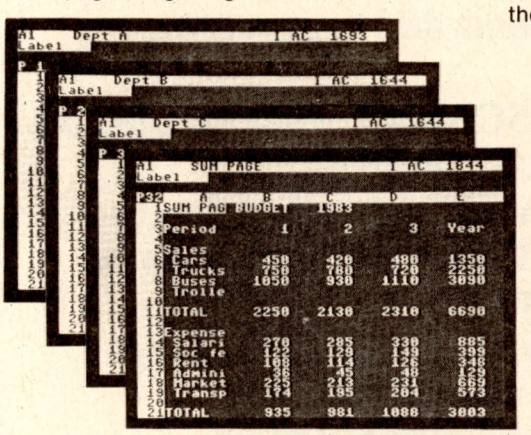
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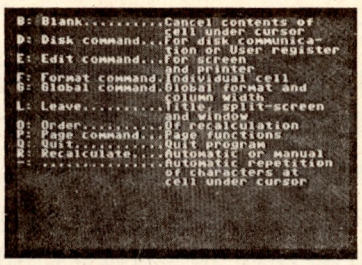
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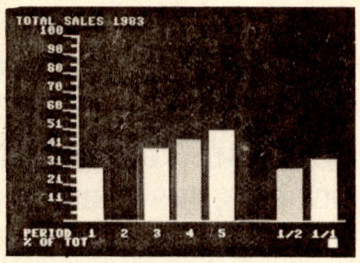
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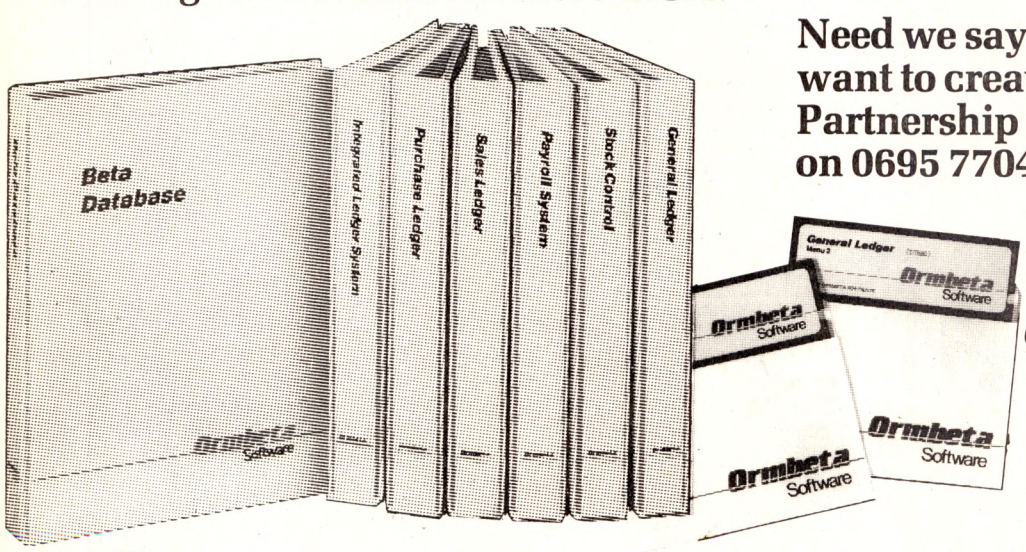
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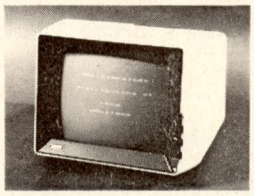
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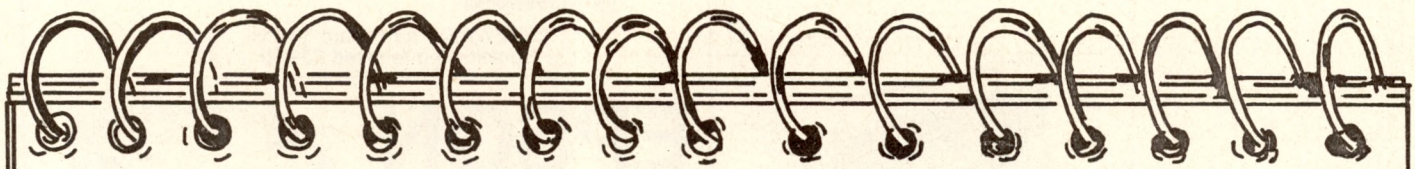
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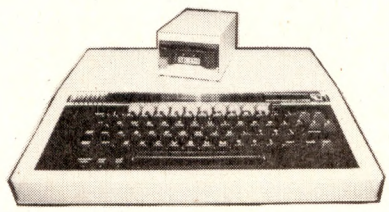
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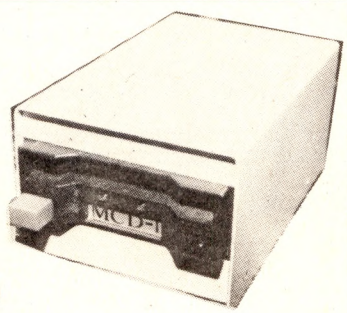
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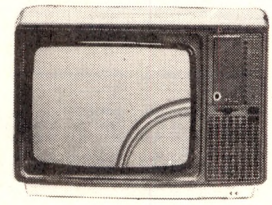
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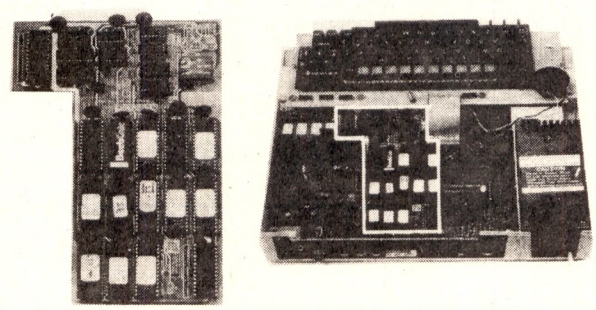
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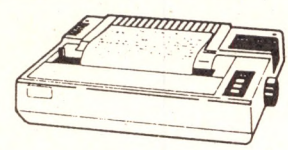
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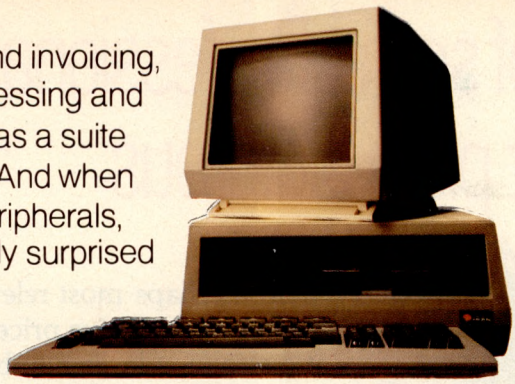
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– What Micro?, Dec 83



ADVENTURE REVIEWS

"This has to be the bargain of the year. If adventures are your game then this (Colossal Adventure) is your adventure."

– HCW, 5 Sept 83

"Colossal Adventure is simply superb. Anyone who wishes to use adventures in an educational setting really must use and see this program as it emulates Crowther and Wood's masterpiece so well. For those who wish to move onto another adventure of similar high quality, Dungeon Adventure is to be recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!"

– Educational Computing, Nov 83

Colossal Adventure is included in Practical Computing's Top 10 games choice: "Poetic, moving and tough as hell."

– PC, Dec 83

"To sum up, Adventure Quest is a wonderful program, fast, exciting and challenging. If you like adventures then this one is for you"

– NILUG # 1.3

"Colossal Adventure . . For once here's a program that lives up to its name . . a masterful feat. Thoroughly recommended"

– Computer Choice, Dec 83

"wholly admirable"

– Your Computer, Sept 83

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1: COLOSSAL ADVENTURE
A complete, full size version of the classic mainframe game "Adventure" with 70 bonus locations added.

2: ADVENTURE QUEST
Centuries have passed since the time of Colossal Adventure and evil armies have invaded The Land. The way is long and dangerous; but with cunning you can overcome all obstacles on the way to the Black Tower, source of their demonic power, and destroy it.

3: DUNGEON ADVENTURE
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7: LORDS OF TIME
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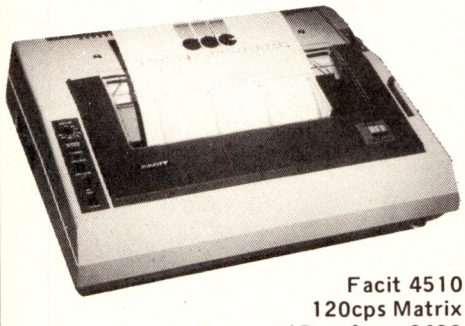
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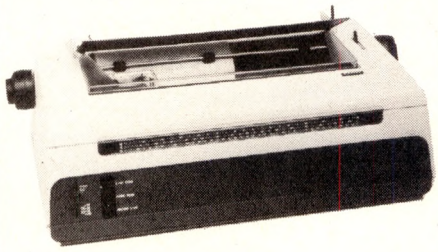
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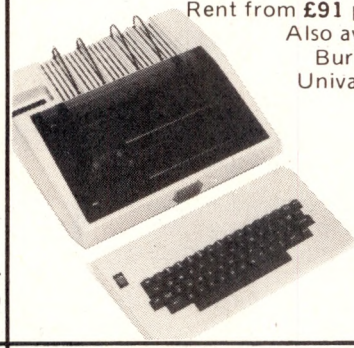


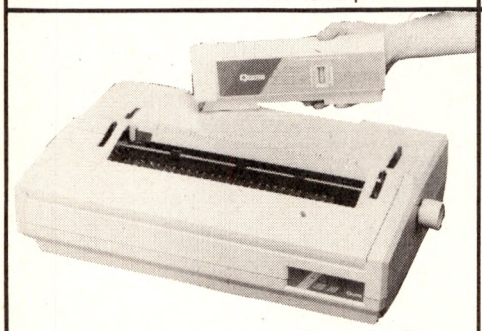
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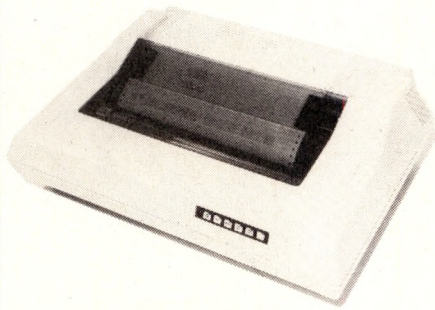
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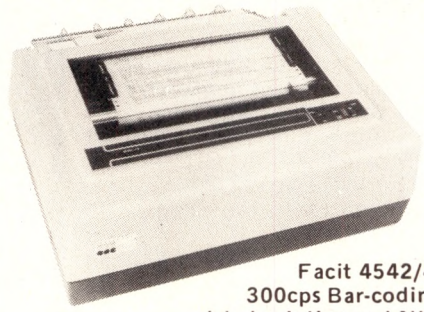




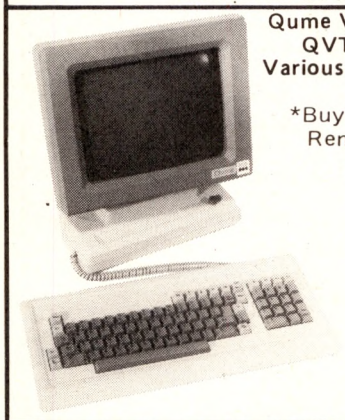
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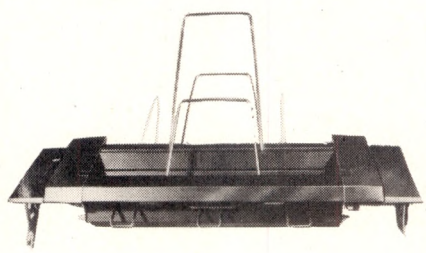
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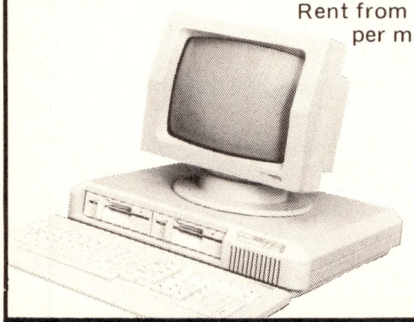


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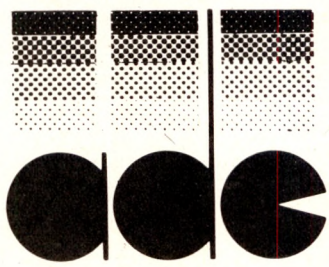


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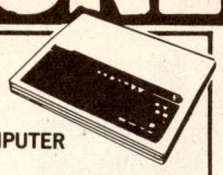
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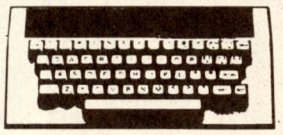
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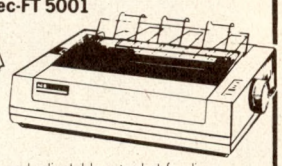
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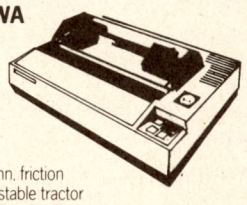
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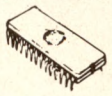
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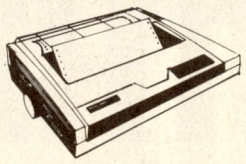
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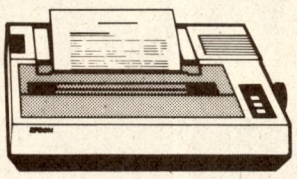
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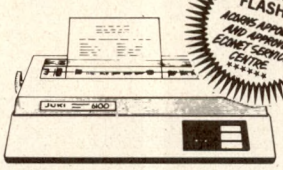
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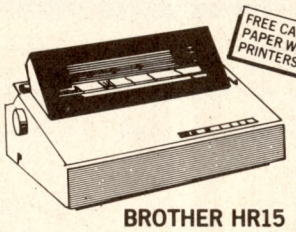


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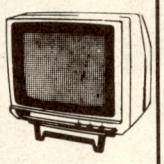
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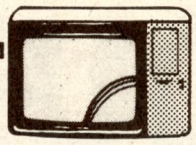
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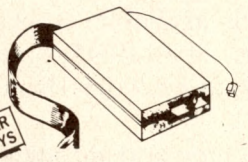
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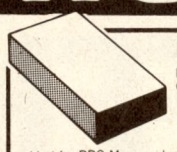
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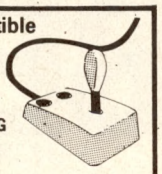
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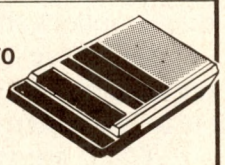


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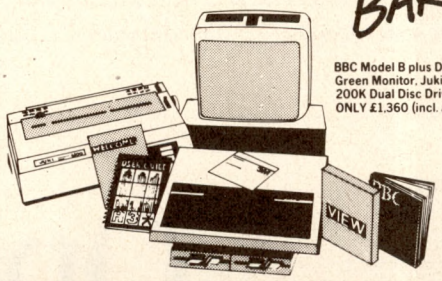
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Hardware - 32K RAM on the MTX500, 64K on the MTX512.

The MTX500 has 32K of user RAM as standard (64K on the 512), expandable to 512K plus 16K of video RAM, controlled by a separate Video Processor. Sixteen colours, 40 column text, 256 x 192 high resolution graphics with all sixteen colours available, and 32 easily moveable user defined graphics characters (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics printer port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 4 channel sound with hifi output plus a dedicated cartridge port. Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight 2-function keys and separate numeric pad.

Software

The MTX's 24K ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, MTX LOGO commands, NODDY. ROM routines include an ASSSEMBLER/DISASSEMBLER with screen display of the Z80 CPU registers, memory and program,which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to split the screen into a maximum of eight sections to work independently whilst maintaining all full screen facilities. Pascal is available as an add-on ROM pack.

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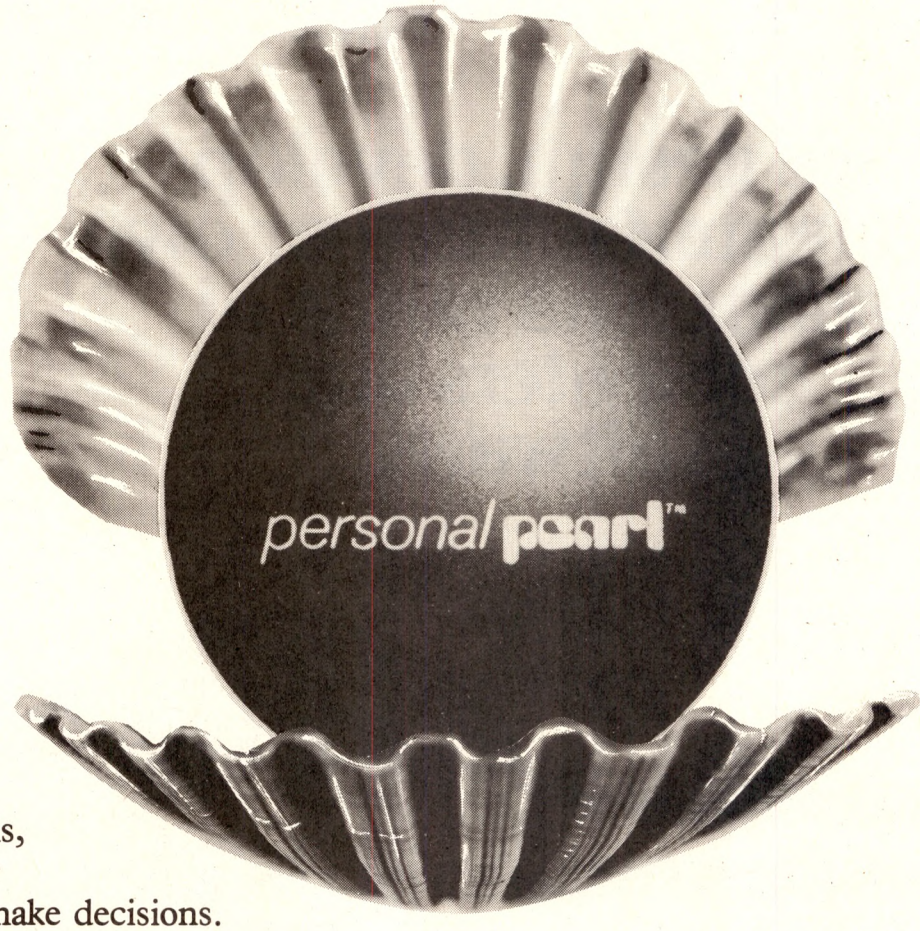


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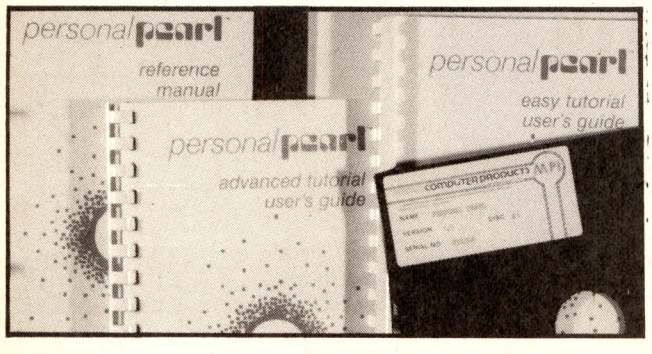


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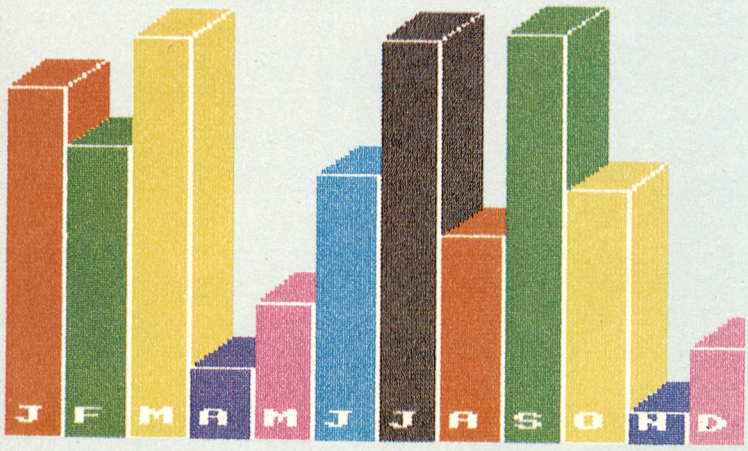
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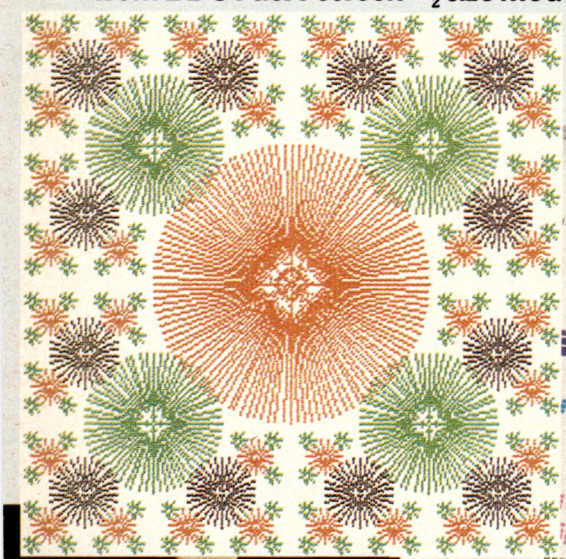
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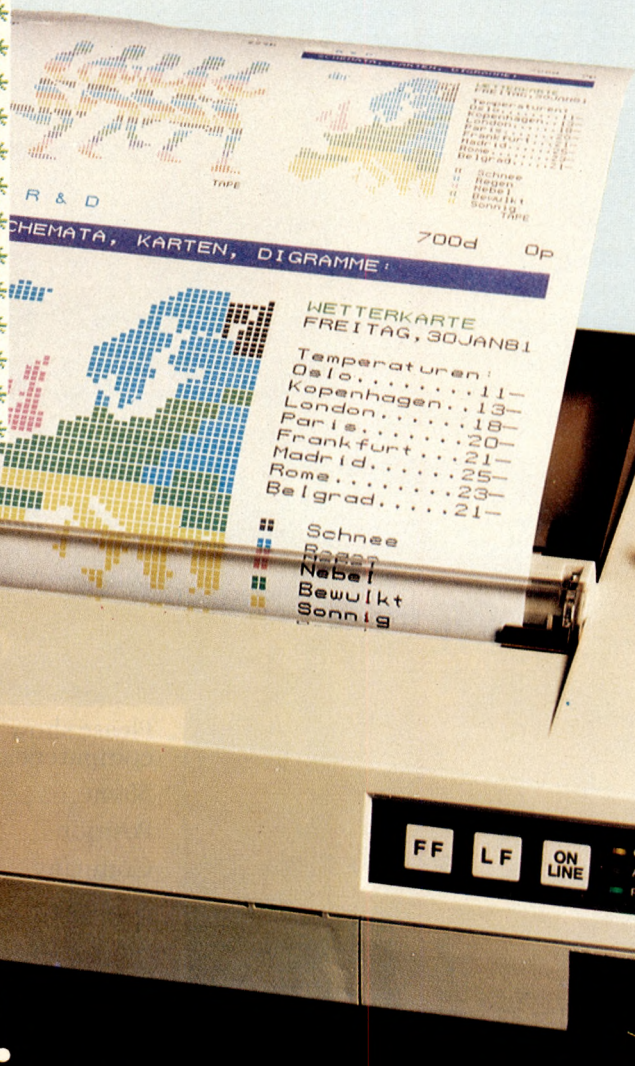
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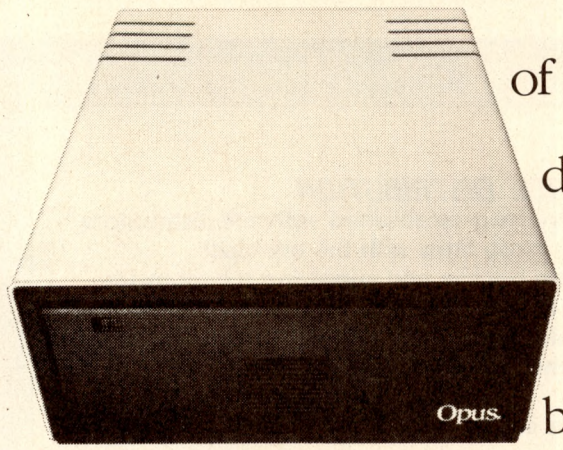
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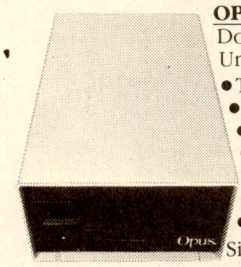
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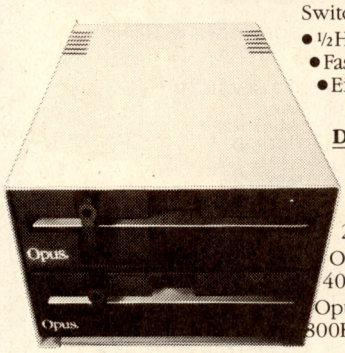
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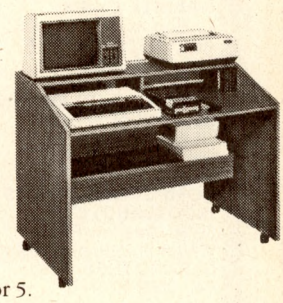
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MULISP/MUSTAR	MicroSoft	□		
MUMATH/MUSIMP	MicroSoft	□		
PASCAL/MT+	Digital Research	□	●	*
PASCAL/MT+ & SPP	Digital Research	□	●	
PERSONAL BASIC	Digital Research		●	
PL/I	Digital Research	□	●	*
XBASIC	Xitan	□	●	

		CP/M-80	CP/M-86	PC-DOS
Programming Tools (inc. Cross Assemblers)				
ACCESS MANAGER	Digital Research	□	●	
ANIMATOR	MicroFocus	□	●	
AUTOCODE (for dBASE II)	Stemmos	□	●	
EDIT	MicroSoft	□		
BT-80	Digital Research	□		
DISPLAY MANAGER	Digital Research	□	●	*
FORMS 2	MicroFocus	□	●	
MACRO	Microsoft	□		
M2CBASIC	Digital Research	□	●	*
MICRO/SPF	Digital Research			*
PROGRAMMERS UTILITIES	Digital Research	□	●	*
QUICKCODE (for dBASE II)	Fox & Geller	□		*
SID	Digital Research	□	●	*
SPP	Digital Research	□	●	
WORDMASTER	MicroPro	□	●	
XASM18 (1802)	Avocet	□		
XASMF8 (F8/3870)	Avocet	□		
XASM65 (6502)	Avocet	□		
XASM68 (6800/01)	Avocet	□		
XASM48 (8048/8041)	Avocet	□		
XLT86	Digital Research	□		
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Operating Systems				
CP/M	Digital Research	□	●	
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MP/M II	Digital Research	□	●	
CP/M-86 (IBM PC)	Digital Research		●	
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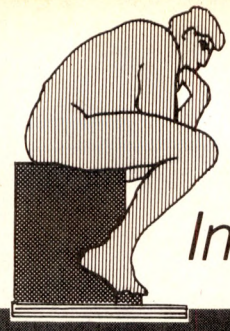
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BENCHTEST

Gavilan

A portable business computer system which costs in excess of £4000 needs to prove that it's more than an 'executive toy'. So, what's the fascination behind the Gavilan MC? Surya takes an exclusive look at the prototype.



The Gavilan Mobile Computer: first of the third-generation portables

Photography by Crispin Thomas

This preview was to have been a Benchtest. The reason it became a preview was that the review machine, a pre-production prototype and the only Gavilan in Europe, was a cross between the original specifications and the revised design of the production models. The strain of having Hitachi 3in disk-control circuitry and a Shugart 3.5in drive eventually proved too much for the machine, causing it to lock up just as I began the Benchtest. Rather than wait another month or more to present a full review, it seems sensible to give you a taste of the machine now, based on the time I did spend with it. We will, of course, be carrying out a full Benchtest in a later issue.

Before I launch into a description of the Gavilan Mobile Computer (Gavilan MC from now on), it seems a good idea to look first at where the machine belongs in the evolution of micros.

The Gavilan could be described as a 'third-generation portable'. The first generation of portables comprised little more than glorified programmable calculators — the Casio/Tandy/Sharp hand-held machines with a crude Basic and a tiny amount of RAM. True, people found a startling number of uses for the machines, but they were primarily bought by those whose interest lay in programming for its own sake rather than in practical applications.

Next, and a considerable time later, came the second generation: the 'lap-held' portables of the NEC/Tandy Model 100 class. These differ from hand-held machines in that they can be readily used for practical applications. Their full-sized keyboards, large LCD displays and reasonable RAM capacity make them suitable for serious applications such as word processing.

Although useful in its way, the second-generation portable was never seriously intended as a stand-alone machine: It is used primarily as an easily carried remote terminal/data-gatherer to a desk-top micro.

The Gavilan belongs to the third generation of portable: the stand-alone portable business system. In the price bracket of the Gavilan, we are no longer talking about a machine which is sold primarily as a portable. A machine selling at £4000 has to justify itself as a stand-alone business system, competing on equal terms with machines such as the IBM PC, ACT Sirius and similar.

Since *PCW* will be giving the machine a full Benchtest in a future issue, all I'll do here is give you a mini-tour of the machine.



The Gavilan OS — a Lisa-style operating system

Hardware

The Gavilan MC is based on a 16-bit 8088 processor with 64k RAM as standard. The machine measures 28 × 28 × 6cm and weighs just under 20 kilos. Folded for carrying, the MC looks something like a portable typewriter. It is a convenient size and shape to be carried under your arm, though the lack of a carrying-handle means that it would probably be easier to carry inside a briefcase.

Pressing a release button on the right-hand side of the machine opens the computer, the LCD display folding back over the keyboard. This action switches on the machine.

The keyboard is a full-sized moving-key model with a conventional layout — save for the fact that the prototype, at least, had two carriage-return keys! These had slightly different markings, but appeared to function in an identical manner and neither I nor the UK distributor was able to find any reason for the duplication. I was intending to find out whether they generated identical codes, but this was not to be, so perhaps they can be used to perform slightly different jobs. The right-hand section of the keyboard doubles as a numeric keypad activated by engaging a numeric-lock key.

The LCD display is a reasonable 80 characters by eight lines. The pivot-hinge enables the viewing angle to be easily adjusted. The display quality is average. There is also a socket for an external 80 × 24 monitor.

Between the keyboard and the display is a nine-key 'touch-panel'. Eight of these keys are marked with a function which relates to the Gavilan operating system (see below) and the supplied word processing package. The large unmarked plate in the centre acts as a pointing device to move the cursor, make menu selections, and so on. In other words, it's a solid-state mouse. Moving your finger across the plate drags the cursor with it; tapping the plate is equivalent to pressing a button on a conventional moving mouse.

At the right-hand side of the machine is a telephone jack-socket to allow access to the built-in auto-dial, auto-answer modem. Alongside the jack-socket is a Shugart 3.5in disk drive. This drive has a formatted capacity of a respectable 360k — a greater capacity than many 5.25in drives.

The back of the machine houses a formidable-looking expansion interface. A total of 99 pins! This interface is used to 'chain' peripherals behind the machine. The only add-on in evidence at the time of writing is an 80-column, 50cps, battery-powered, thermal printer, but Gavilan says that others are planned — including an additional 128k RAM and a second disk drive.

'The Gavilan belongs to the third generation of portable: the stand-alone portable business system.'

A RS232 port is located on the left-hand side of the machine. There is no parallel port, since Gavilan expects you to buy its own dedicated printer.

At the top left-hand corner of the MC is a flap which covers four 'capsule slots'. The capsules inserted into these slots may be either RAM or ROM:

BENCHTEST

apparently the MC doesn't mind and is perfectly capable of telling the two apart. RAM is known as 'CapsuleRam' and ROMs are collectively known as 'CapsuleWare' (CAPSULE softWARE).

The business of memory is confusing. Gavilan's specifications describe the machine as having 80k of internal memory, of which 32k is available to the user. It appears that the 80k figure was reached by adding together 32k RAM and 48k ROM. According to Adam Computers, the UK distributor, what you actually get in the way of RAM is 32k internal plus an additional 32k RAM 'capsule' which plugs into one of the four capsule slots.

Since each of the three other capsule slots may hold an additional 32k RAM, we get 32k (internal) + (four × 32k) (CapsuleRam) = 160k. Add to this the planned 128k RAM pack connected through the expansion interface and the machine has a maximum RAM capacity of 288k. The reason Gavilan quotes 80k would seem to be because the specifications (not to mention delivery dates) have changed significantly since the UK launch in May of last year (see Newsprint, *PCW*, July '83).

That just about concludes the mini-tour of the hardware, and so to the software.

Software

The Gavilan is supplied with two operating systems: MS-DOS and Gavilan's own custom-designed OS. Since MS-DOS is the same operating system we all know and love, I'll move straight onto the Gavilan OS.

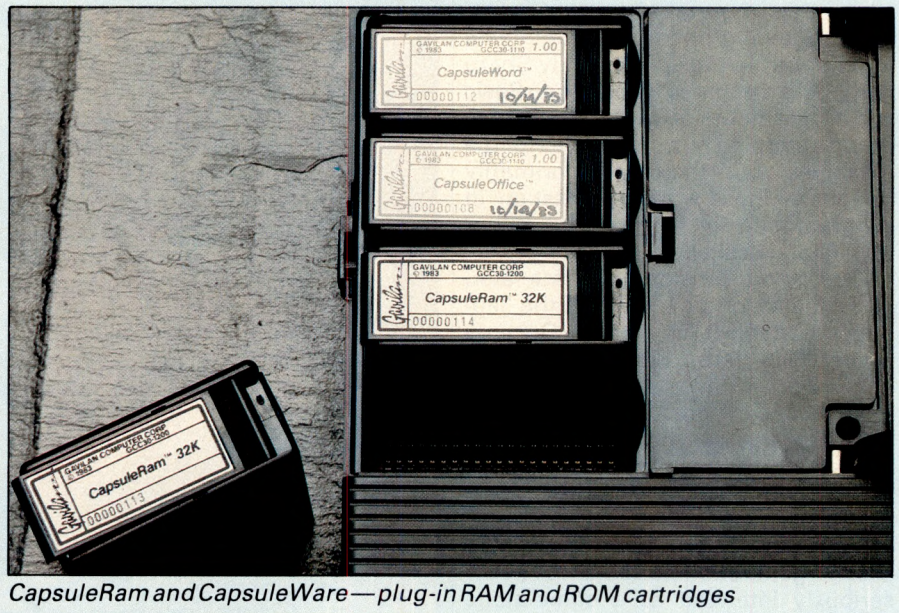
The Gavilan operating system is trying very hard to be a Lisa. It has the same pop-up menus, and the system is largely controlled by the 'mouse-plate'.

One very annoying feature of the prototype, which I hope has been corrected on production models, is that when you make an error all you get by way of an explanation is a beep. No error-message, just a beep. To find out what caused the beep, you have to call up the HELP menu and select the 'What just happened?' option. This then gives you a nice, friendly explanation along the lines of:

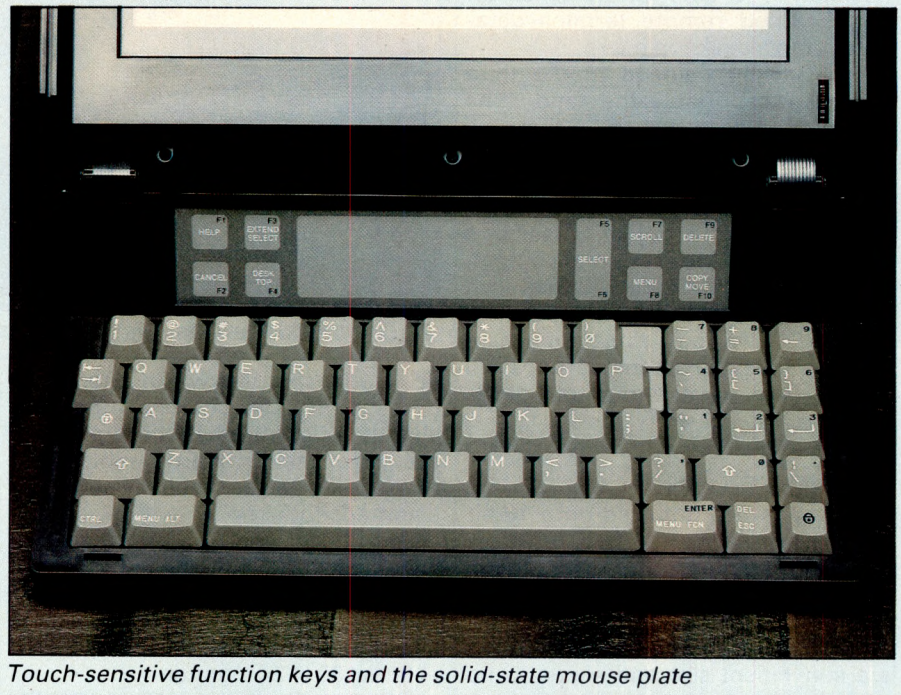
'What just happened?
You just reset the system
Then you tried to open a file, but the disk is unintelligible.'

My favourite error-message was **'Something funny just happened.'** This response was provoked by the Gavilan eating the file I had just created. Since this file was just a dummy text filled with gibberish, I didn't particularly mind, but it did occur to me that had the file been something important I might not have been as amused as the MC apparently was!

Several help prompts and error-messages appeared to be missing on the prototype — the **'What just happened'** option sometimes produced only a blank screen — so, all I can really say is that the operating system has the potential to be very nice indeed.



CapsuleRam and CapsuleWare — plug-in RAM and ROM cartridges



Touch-sensitive function keys and the solid-state mouse plate

CapsuleWord

I think CapsuleWord is Microsoft's own 'Word' — the word processor hastily renamed for the UK market after someone raised an eyebrow at 'Multi-tool'. It was a few minutes after I began experimenting with this program that the machine decided that it had had

Postscript

Since carrying out this preview, Gavilan has announced that all production models will have a 16-line LCD display replacing the 8-line one of the prototype.

The 8-line model will be sold with MS-DOS only, as the Gavilan SC, at a lower price.

A full Benchtest of a production model will be carried out in a future issue.

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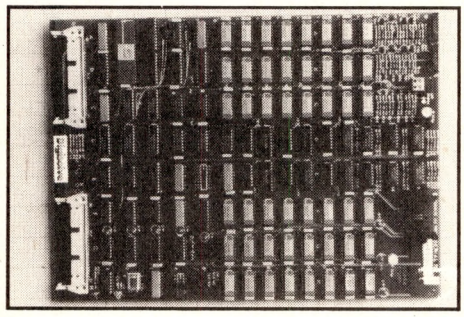
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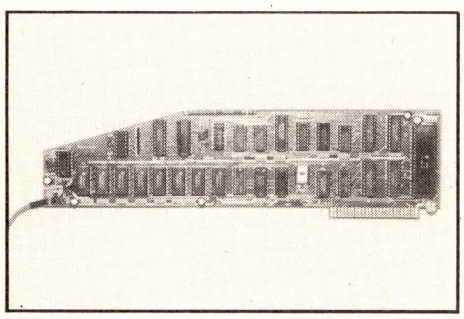


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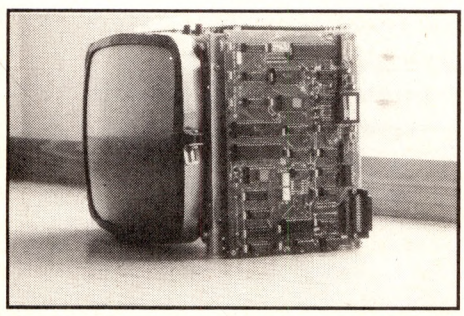
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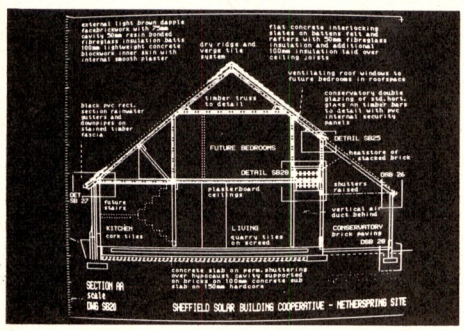
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BENCHTEST

enough, and I've given up trying to get yes-or-no answers out of Gavilan.

CapsuleWord is similar to 'Word'. Most of the menu selections and editing are mouse-controlled. The editor works on a 'what-you-see-is-what-you-get' basis, even down to the different typefaces. Bold, italic, subscript — everything is shown on the screen as it will be printed rather than as esoteric control-codes.

An interesting feature is the 'condensed document' option — one of the indications that the program is Microsoft Word. This option displays a picture of the file, showing the shape of the document and the whereabouts of the screen window. It's surprisingly easy to identify a section of the file by its position and shape.

The screen window is adjusted to 24 lines if you have selected the external monitor option. A minor point, but perhaps indicative of the quality of the design.

In the short time I had to play with the editor I couldn't form a full opinion, so I can only repeat my comment about the OS — it has the potential to be a very impressive word processor. I'll wait for the full Benchtest to see whether it realises this potential.

Four other pieces of software are also included in the price: a spreadsheet, communications package, diary program and something called CapsuleForm, for which I don't have any details. All the software packages are known, confusingly, as CapsuleWare. I say 'confusingly' since all five packages are supplied on disk, though they are available in capsule form at extra cost.

Prices

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Gavilan Mobile Computer	4020
Portable thermal printer	910
Additional 3.5in floppy drive	748
32k CMOS CapsuleRam	345
MBasic compiler (MS-DOS)	330
WordStar + SuperCalc2 (MS-DOS)	1050

All prices include VAT. Price of the MC includes CapsuleWord, CapsuleCalc, CapsuleComm, CapsuleOffice and CapsuleForm.

Conclusions

The Gavilan Mobile Computer is a fascinating machine. I wouldn't complain if someone gave me one for my birthday.

The prototype had a number of bugs. The main one was the problem of the disk drive, but others included non-existent error-messages and the (fluke?) time when it zapped my file. Gavilan never pretended that this was a production machine, so until the full Benchtest we'll have to give it the benefit of the doubt and assume that these problems have now been rectified.

It seems to me that the machine is being pitched at two very different though possibly overlapping markets: executive toy and professional business computer system.

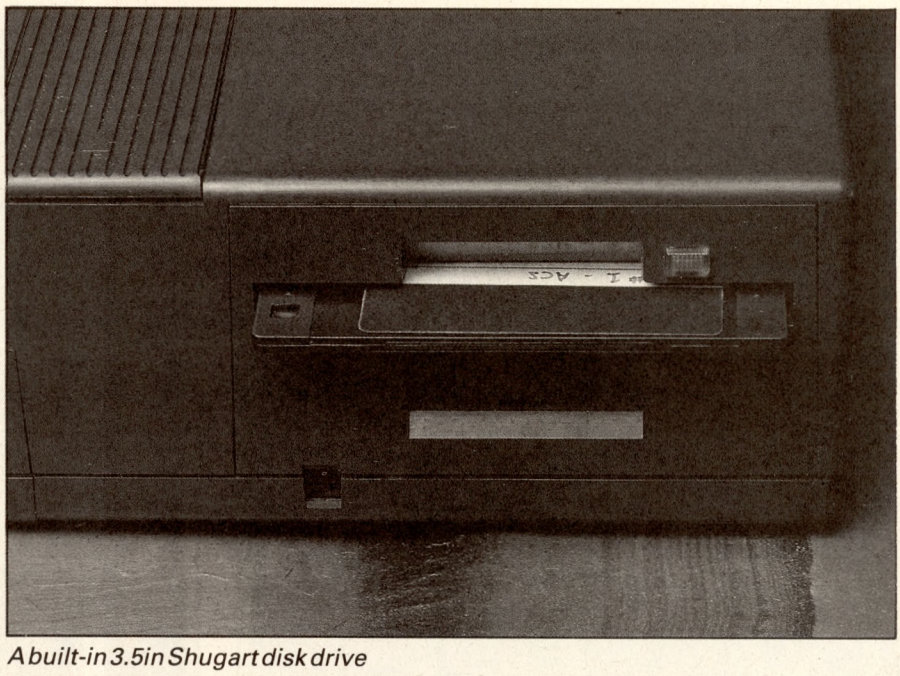
As an executive toy, it's very expensive and very appealing. Although it is aimed at a small minority in this role, the population of the US is large enough to make even a tiny minority add up to a viable market. By comparison, I would have thought the UK market for this sort of toy insignificant.

As a fully-fledged, stand-alone business system, it is rather more difficult to evaluate. A 16-bit machine running MS-DOS sounds like a reasonable start, but 64k standard RAM is not really acceptable for a 16-bit business micro: most machines offer, and many programs expect, at least twice this. The cost of the extra 64k would have to be added to the price of the basic machine.

The MC offers what appears to be a perfectly acceptable, and possible exceptional, word processor, but very little other software is currently available in the Shugart disk format. If I were considering the system, I would hesitate for this reason alone and see what happened in the way of software.

On balance, I feel somewhat sceptical about the machine's future as a business machine based on what I've seen to date. Whatever its merits, it is significantly more expensive than equivalent desk-top systems: a customer would need a pretty good reason for wanting portability to justify the added expense. The MC may also be seen as nothing more than a toy — as I said in the introduction, the Gavilan MC has to compete on equal terms with micros such as the IBM. Above all, everything connected with the machine is grossly overpriced; a US executive with a fat expense account might be able to afford it, but I doubt that many British businessmen will be impressed. Perhaps I'll be proved wrong, but I think the machine will be an enormous hit in the US and a complete flop in Britain.

END



A built-in 3.5in Shugart disk drive

Technical specifications

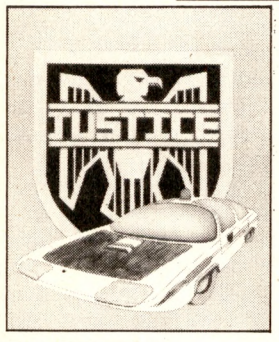
Processor	8088
RAM as standard	32k internal + 32k 'CapsuleRam'
Maximum RAM	288k
Keyboard	Full-sized, 66-key
Display	80 × 8 LCD plus 80-column monitor option
Disk drive	3.5in Shugart, 360k formatted
Power	8-hour life rechargeable Ni-cad battery pack
Communications	Built-in 300-baud auto-dial/answer modem, RS232 port

MICRO GOLD

INDEPENDENT PROGRAMMER'S MARKETING SERVICE

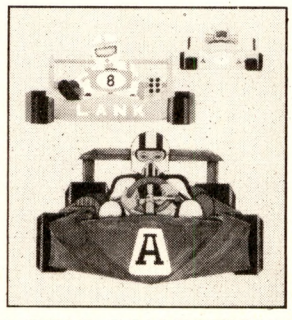
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HISOFT PASCAL DEVPAC

Hisoft Pascal 4 is a very fast and powerful microcomputer Pascal compiler, that is the result of three years development work. The compiler conforms very closely to Standard Pascal as described in the Pascal User Manual and Report (Jensen/Wirth) and produces Z80 object code direectly in one pass; no P-codes to be subsequently interpreted. HP4 is also small (not more than 19K including runtime routines and tables) but this does not imply any lack of power — the compiler and runtimes were written in Z80 assembler language and a great deal of time was spent on increasing the speed and decreasing the size of the critical routines.

We have designed HP4 to be simple to use, very fast, close to Standard Pascal (with extensions) and inexpensive. Thus we see it as being an attractive package in the level) and in the area of systems development. To this end Hisoft Pascal 4 is available in both cassette tape and diskette versions for a wide range of Z80 machines. The tape and disk versions are virtually identical except that the cassette version does not support FILEs, instead the user is given the ability to store and retrieve any variable to and from tape. The tape version (HP4T) is organised in a manner that makes it very easy to adapt to ost Z80 systems and we supply details on how to do this in our HP4T Alteration Guide available separately.

In addition to our Pascal we also have available DEVPAC — a Z80 development package which includes a fast and powerful conditional assembler, a labelling disassembler, a debugger with single-step facility (even in ROM) and (on diskette) and extended screen editor. DEVPAC is a highly professional suite of programs which will greatly facilitate your software development.

★★★★STOP PRESS★★★★
Hisoft Pascal now available for the SHARP MZ700!
Pascal for the ZX Spectrum now includes FREE Logo-style Turtle Graphics!
DEVPAC 3 is now available with all the features you will ever need from an assembler/disassembler — see review in Which Micro (September).

★★★★STOP PRESS★★★★

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HISOFT PASCAL 4 tape version (48K ZX SPECTRUM)
HISOFT PASCAL 4 disk version (SHARP MZ80A/B/K, SUPERBRAIN, RML380Z, 8in formats etc.)
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All the above prices are fully inclusive of 15% VAT and P&P within the UK. Add #2 for orders to the mainland of Europe and #4 to other countries.

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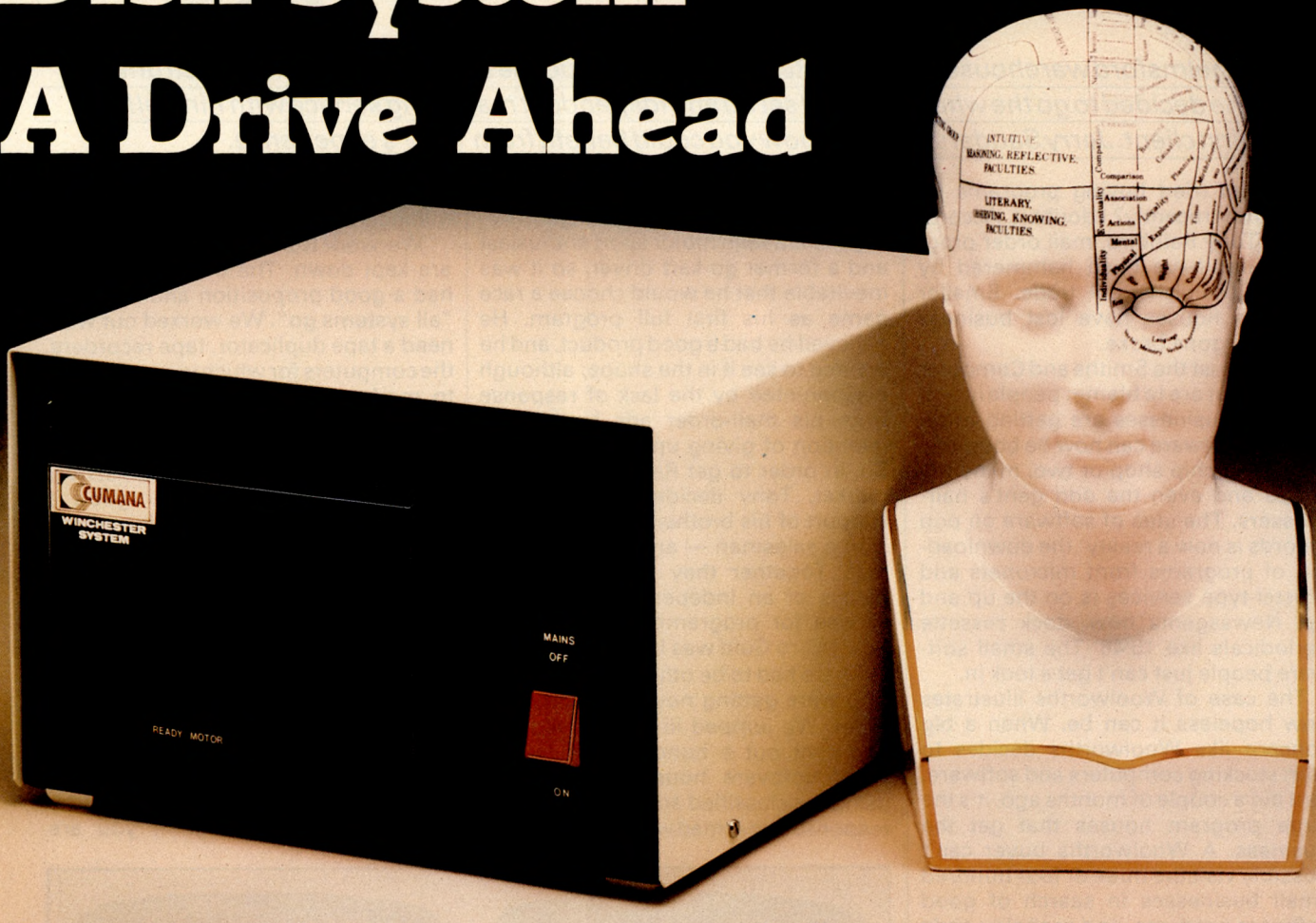
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Rainbird's revenge

When Chelmsford warehouseman Tony Rainbird got no response to a small-ad for his Spectrum game, he decided to go the whole hog and set up an independent marketing service with himself as the first client. Jerry Sanders finds out how you could benefit from Tony's experience.

Have you tried buying programs by mail order recently? I doubt it. According to Tony Rainbird, mail order program sales have been hammered by booming High Street trade. Smaller software houses have lost business and even gone broke.

It's not just the Smiths and Computer Shacks that are to blame: people in less obvious businesses are getting in on the act. Software can now be bought in a fish and chip shop or two, many toy shops and even the odd gent's hairdressers. The idea of software on pop records is now a reality: the downloading of programs from micronets and Prestel-type services is on the up and up. Newsagents now stock cassette periodicals like 16/48. The small software people just can't get a look in.

The case of Woolworths illustrates how hopeless it can be. When a big concern like Woolworths decides to start stocking computers and software, as it did a couple of months ago, it's the large program houses that get the business. A Woolworths buyer can't possibly visit the three or four hundred small businesses in search of good software products, and probably ends up not visiting any of them.

The classified columns of micro magazines have long been a traditional market-place for the amateur programmer, but when Tony Rainbird decided to advertise his Spectrum machine-code 'Race Ace' program he never expected total disinterest. Fed up by this lack of response, Tony decided to do it his way.

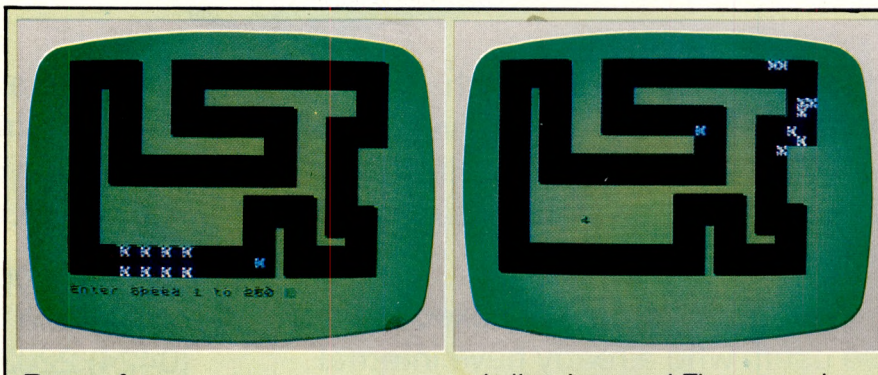
In the beginning

Tony, 31, is a warehouse supervisor. He lives in Chelmsford with his wife, Lesley, and their two children. He bought himself a Spectrum in April 1983 and within six weeks began experimenting with machine-code programming. 'I went the hands-on way: the only way if you ask me,' said Tony. 'I used a Melbourne House book, *Machine Code Programming for the Absolute Beginners,* in conjunction with the Sinclair book that came with the Spectrum. I work in decimal because I can remember the codes easily: I use the Spectrum to convert everything to hex afterwards, because using assembler is just too confusing.'

Tony is a keen motor sport enthusiast and a former go-kart driver, so it was inevitable that he would choose a race game as his first full program. He believed he had a good product, and he wanted to see it in the shops; although disappointed by the lack of response from his mail-order ads he had no intention of giving up quite so easily. So, in order to get Race Ace onto the market, Tony decided to enlist the support of his brother, Jim, by profession a salesman — and a good one at that. Together they worked out the details of an independent marketing service for programmers, and that's how Micro Gold was born.

'There had to be other people like us, who were getting nowhere with mail-order. We jumped in at the deep end and sent out a hundred circulars to small software houses which were using the classified ads. We got a good response and armed with the replies we went along to talk finance with the bank manager.'

'We work from home so overheads are kept down. The bank thought we had a good proposition and so it was "all systems go". We worked out we'd need a tape duplicator, tape recorders, the computers for which we were going to market software and some office equipment. There was one other very important consideration: artwork. Once you decide to try and market over the counter, then however good a program is, if the tape isn't taken off the shelf for a good look by the customer it probably won't get sold. Artwork is the key to this door. You'll probably know that the small mail order companies don't often bother with this: in the first place they sell by description, and in the second they often can't afford it. Your program usually arrives in a box without an insert; you might get a sticky label if you're lucky. The problem is a Catch 22 one: you can only get the artwork cheaply enough if you are



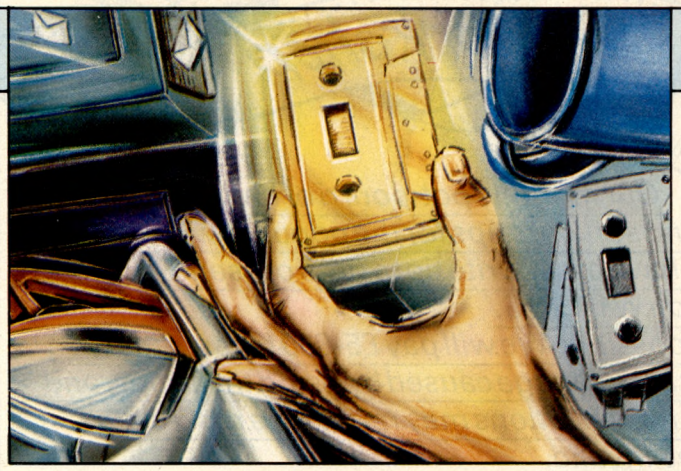
Race Ace

Any thoughts I had about go-karting being a few kids with soap boxes rolling down pavements on Sunday afternoons were zapped fast. It was on the first of 16 corners that the true nature of these homicidal maniac karters was revealed to me — and that still left 15 to survive.

Race Ace is a no-holds-barred scramble for glory between you and eight of these tyre-wasters. You play at a speed chosen between 0 and 250, with 190 being a suitably challenging speed. The race can be of any length, but 12 laps without a pit stop was enough for me.

At the end of the race, points are awarded based on your race position and the speed selected. 250 points is the (surely unattainable?) maximum score. I'm delighted to say that I managed to win a race, as my wife will testify, since I joined in with the cheering as my kart did its lap of honour.

If only the other karts wouldn't queue to carve you up on the corners, this would be a very enjoyable game . . .



ordering long print-runs. Our philosophy is that the artwork has to be done well because that's what makes or breaks a game on the display stands.'

Working together

But how to get the goods into the shops? That's where Jim comes into the picture. Tony is confident that Jim will be able to place Micro Gold software where it counts by tried-and-tested methods: going on the road and taking the products to the people.

'We plan to release games in groups of 5,' said Tony. 'As the programs come on stream from writers, I shall assess them for marketability myself. Once I've picked out the first batch I will commission the artwork, and at the same time prepare a catalogue which we will add to as we go along. We have games coming in already, and there are some marketable ones among them. I'm sure there are enough frustrated programmers out there for the venture to be successful.'

Since Tony set so much store by his ability to judge other people's games after only six months experience as a programmer, I asked him to 'put something up front' and send his two machine-code games into *PCW* for us to review. Tony agreed.

'These will be Micro Gold's first two products,' he said, 'and they'll be available at the promotion price of £2.75. Race Ace is the go-karting game I wrote first. The other is called Run Baby Run, and it's a 'cop-chase' game with a shoot-out at the end.'

I asked Tony Hetherington, *PCW*'s Home Computing Editor, to review Micro Gold's first offerings (see below). It was obvious that his findings could have serious consequences for Micro Gold, and it was a measure of Tony Rainbird's confidence in his own acumen that he agreed to let *PCW* write them up.

While Tony Hetherington was chasing and being chased, I went back to Tony Rainbird and asked him how would-be programmers and Micro Gold would get together. 'Let's suppose,' said he, 'that you were to send us your program. The first thing we do, assuming Micro Gold decides to take it on, is exchange contracts. We require exclusive marketing rights for a specified length of time, negotiable between us and with an opt-out clause for the programmer if he can show that we aren't giving his program all the support he expected. We don't ask for the copyright. The initial evaluation is free, and if and when we decide to go ahead then *we* commission and pay for the artwork and printing. Our revenue will come from sales of the tapes and we estimate that each games tape will retail for about £5.50, of which the programmer can expect to receive £1.20.'

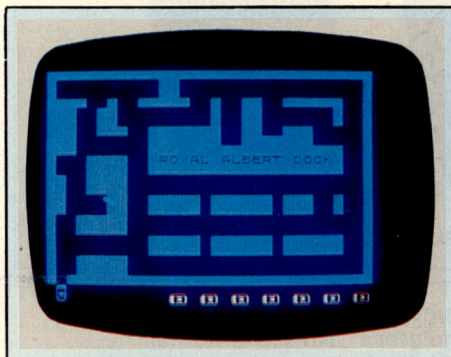
The future

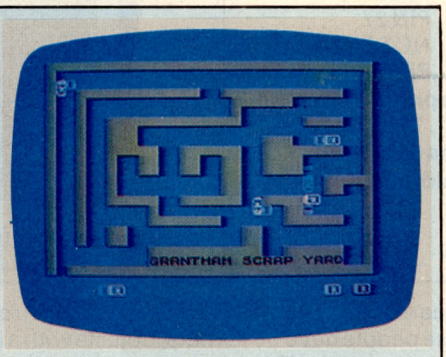
So, should *PCW* readers start sending tapes to Micro Gold? Was Surya going to have a fight to survive? Tony Rainbird was at once enthusiastic and cautious.

'Both Jim and I have full-time jobs at the moment. So far we have set up the basics of the business and started to evaluate the tapes sent in by the software houses to whom we wrote. I reckon some of them are of marketable quality, but I must stress that I take the evaluation stage very seriously. It's vital to make sure from the start that Micro Gold acquires a reputation for quality software. Then, anyone who is accepted by us knows that he is going to be supported properly.'

'I suggest *PCW* readers who are interested should write to us for details of our procedures, to get an idea of what we can and can't do. We aren't, for example, in the business of turning ideas into programs. But if a reader has a program ready to go, he can send it to us for evaluation — there is no obligation on either side. We hope to have our first batch of games ready for marketing very soon now.'

By the time you read this Micro Gold hopes to be well into its first batch of programs. If the idea enables more programmers to get more good programs to more satisfied customers, it deserves to succeed. END





Run Baby Run

Run Baby Run is a maze game with a splendid difference. Instead of chasing off or shooting monsters, you try and engineer pile-ups among the police cars chasing *you*. Six of them, setting off at regular intervals, drive into the maze and try to bust your fenders. With luck they'll rub each other out, but when they do the wreckage constitutes a further obstacle for you to avoid. If you manage to get them all to destroy each other a seventh cop car appears. This one's really mad at you, and he shows it: he bulldozes through everything just to get at you.

Once a screen is completed, (smashed cops or wrecked you), the next appears. Each is slightly different, and the locations take the breath away: Grantham Scrapyard, Oxford Brewery and Bolton Gas Works to name but a few. The cars, by the way, are drawn from two graphics characters which gives them a smooth action; and the intelligently spaced control keys don't distract you from the fun.



T.J.'s Workshop

Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to TJ's Workshop, PCW, 62 Oxford Street, London W1A 2HG. Please keep your contributions as concise as possible. We will pay £5-£30 for any tips we publish. PCW *can accept no responsibility for any damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.*

Dragon screen dump

The program here takes each pixel of the display, examines it and if it is found to be set, a block is printed on the printer otherwise a space is printed. Line two puts the printer into graphics mode; lines 40 and 50 set up the loops; lines 60 and 70 test the pixel and act accordingly; line 90 is there to cause a line feed; and line 110 puts the printer back in text mode.

The program is written for a Tandy line printer VII — a printer which many schools will have.

To connect the printer a lead will have to be made. I found it easier to buy a Tandy model 100 printer lead (Tandy part No = 26 – 1409) and adapt it, rather than buy bits separately. To connect the lead you must first cut the computer connector down to size. This can be done using a junior hacksaw to cut off the six connectors at the opposite end to the one with the blue stripe. When you have done this, cut the ribbon cable about six inches from the computer and using terminal blocks or by direct soldering reconnect the lead in the following way:

Pin 1 is the one with the blue wire on both the computer and the printer.

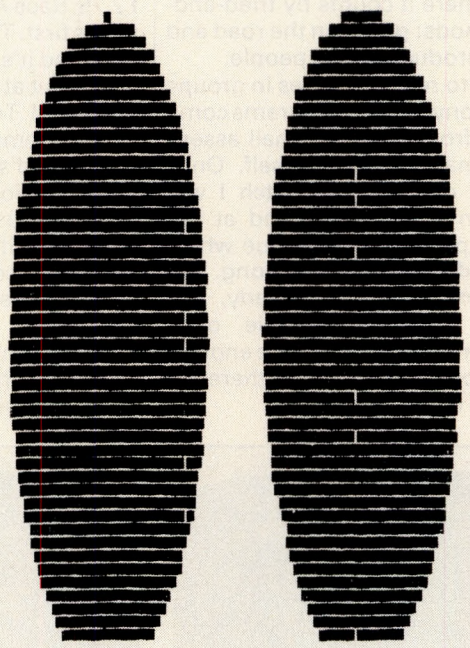
MICRO	PRINTER
PIN 1	PIN 1
PIN 2	NOT CONNECTED
PIN 3	PIN 2
PIN 4	NOT CONNECTED
PIN 5	PIN 3
PIN 6	PIN 22
PIN 7	PIN 4
PIN 8	PIN 22
PIN 9	PIN 5
PIN 10	PIN 23
PIN 11	PIN 6
PIN 12	PIN 24
PIN 13	PIN 7
PIN 14	PIN 25
PIN 15	PIN 8
PIN 16	PIN 26
PIN 17	PIN 9
PIN 18	PIN 27
PIN 19	NOT CONNECTED
PIN 20	PIN 11

Please note printer wires are numbered 1, 19, 2, 20, 3, 21, etc, whereas computer wires are numbered 1, 2, 3, 4, 5, etc.

Ian Bowker

```
DRAGON SCREEN DUMP
WRITTEN BY IAN BOWKER

2 PRINT#-2,CHR$(18)
40 FORI=0 TO 191
50 FOR D=0 TO 255
60 IF PPOINT(D,I)=0 THEN PRINT#-2,CHR$(128);
70 IF PPOINT(D,I)<>0 THEN PRINT#-2,CHR$(191);
80 NEXTD
90 PRINT#-2,CHR$(128)
100 NEXTI
110 PRINT#-2,CHR$(30)
```



THE PROGRAM REQUIRES A TANDY LINE PRINTER VII TO RUN

Spectrum tuning

Many people have criticised the poor colour available on the *ZX Spectrum*, even after much time spent adjusting their TV sets. This in turn causes more people to assume that their picture will never be very good, and so they give up all their attempts to improve the quality. Some even send their computer back to Sinclair in the hope that a replacement will be of a higher standard.

What these people have failed to realise is that the TV output can be adjusted far better internally. For those who are not afraid of a screwdriver, here are the details. First, remove the power lead, TV lead and cassette leads from the computer. Then, with a Philips screwdriver, unscrew the five screws on the base of the computer. Put the computer down facing you and gently lift the keyboard; be careful, the connectors from the keyboard to the PCB are quite short. Look for two variable resistors (round, metal objects with a hole for a small screwdriver on top) on the left-hand side. Directly above them is a white plastic object, again with a slit on top. This is the trimmer capacitor for the TV display crystal. Reconnect the power and TV leads, and enter this program. (The keyboard will still work, but don't touch anything inside the case.)

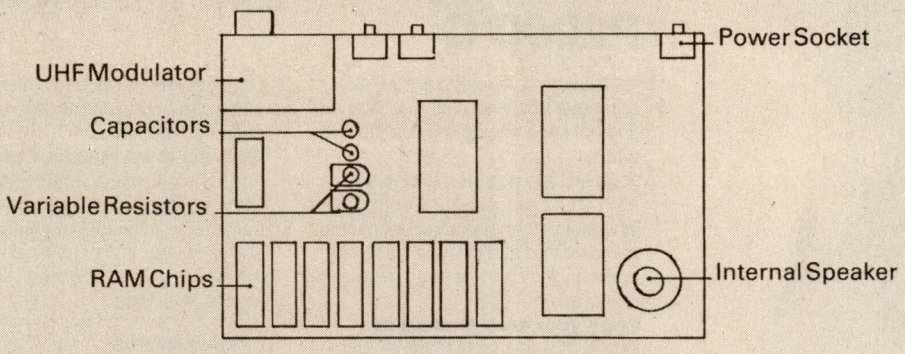
```
10 FOR G=0 TO 7: FOR H=0
TO 1
20 PRINT PAPER G; BRIGHT
H;"  "
30 NEXT H: NEXT G
```

RUN this once, and leave the display on the screen. Now, with a small screwdriver, adjust the capacitor until the 'crawl' vanishes. This is quite a delicate job; don't hurry. Then, if you want, adjust the resistors to give the balance of colour you want; even black and white is possible if you really want it. Remove all the leads before you put the case back together, and avoid touching any of the other components. One last word of warning: this was done on an issue one Spectrum. There may be some changes on the issue

two PCB.

Please note that you may have to retune the computer for different TV sets. This is especially useful if you change from a black and white set to colour as the changes are easily reversible and this should be no trouble.

Bill Longley



Spectrum tuning

Despacer

Despacer is not a program for getting you rapidly straight when tired and emotional. It removes any invisible spaces at the end of a Basic line that may be consuming valuable RAM. These spaces tend to creep in when editing. The flying digit hits COPY and copies in a space or two at the line end to ensure that the last character is not missed.

To use Despacer, LOAD and RUN it. This sets up user-defined key f9 to operate on a subsequently LOADed Basic program which I'll call the object program. Despacer will run on itself.

Despacer will not remove the single space after a line number that forces a blank line.

The main Despacer program prints out information on itself and then clears all the user-defined keys. Only 255 character/byte storage is available for these keys —that is, the sum of what is in all the user-defined keys can be up to 255 characters. Additionally an OS bug causes the sum of what is in a key plus what is about to be entered into that key to be checked to see if it is less than 256 characters. Consequently all keys must be cleared before f9 is set up to prevent Bad Key error.

Finally, the main program sets up key f9.

The key program sets LOMEM to HIMEM-99. This provides storage for the key program's variables well above the object program's TOP. The resident integer variables have not been used to save all those per cent signs, and consequently space, in the key.

Despacer is most likely to be used on a program where the No Room error has occurred during execution. This would have been due to the program's variable storage expanding up to HIMEM. As an object program its TOP is extremely unlikely to approach HIMEM-99.

?(TOP + 2) is set to 4 to prevent errors occurring when the key program meets the object program's last line. There are then two nested REPEAT UNTIL loops. Before the nested loop the outer loop sets up variables relating to the address of the current line. The nested loop then works from the line end. If the last character is a space, the line length is altered and a running total of the number of spaces removed incremented.

On leaving the nested loop the main loop moves the next line up the total number of spaces removed and, if it is the last line, exits.

If you wish to analyse the key program further you need to know that Beeb Basic lines are stored with a four byte header of the form 0D AA BB LL. Where 0D marks the line start, AA and BB are the two most significant and least significant, respectively, hex digits of the line number in hex, and LL is the hex line length. The last line is marked by 0D & FF.

Writing this and another key program has made me think about how to pack a program into a key. I have formulated a loose process to do this that may be of use to other Beebers.

1) **Create a full working basic program**

This may not be straightforward. Usually a key program is designed to operate on another program, the object program. As the prototype is its own object program all sorts of nasties, including Bad Program, can occur when run. So always save a copy before running.

If the program actually moves stuff in RAM about the program variables, above LOMEM may be overwritten. This can be solved by using only resident integers, which are stored below PAGE, or, as in Despacer, resetting LOMEM.

2) **Remove any line number dependent lines**

Sorry, no line numbers in the key so GOTOs, GOSUBs, ON variable GOTOs must all go.

3) **Get all you can above the IFS**

This bit is not so obvious. As there are no line numbers IFs,

Diskette directory

When I first had my Atari disk drive, I found it very irritating to have to load DOS every time I wanted to see what was on any of my disks. After a little experimentation I discovered how to access the disk's directory from Basic. The program that follows is the result.

I now store this program on all my new disks (it only takes up four sectors), so that every time I want to see what files I have on the disk, I can just type RUN"D:DIR and then enter the file spec when requested, to list those files. (Enter *.* for all files).

To end the program, just press RETURN when asked for the file spec; the program will then new itself.

A word of warning: if you have just written the world's greatest program then save it on the disk before running the directory program, as it will ZAP any program currently in memory.

```
5 DIM A$(17),F$(14),
FN$(12)
10 ?"crrrrrrrdddDISKETTE
DIRECTORY"
20 ?:?:?:"ENTER
FILESPEC . . .";:NF=0
30 INPUT
FN$:FNL=LEN(FN$):IF
FNL=0 THEN NEW
40 ?:F$(1,2)=
"D:":F$(3)=FN$:TRAP 100
50 OPEN#1,6,0,F$
60 INPUT#1,A$:?A$:
NF=NF+1
70 IF A$(5)<>"FREE
SECTORS" THEN 60
80 CLOSE#1:?:?"NO. OF
FILES:";NF-1:GOTO 20
100?:?:?"bERROR—TRY
AGAIN":CLOSE#1:GOTO
20
```

NB. In the listing: 'c' is the clear screen character; 'r' is the cursor right character; 'd' is the cursor down character; and 'b' is the bell character (CTRL-2)

Each of these characters should be preceded by the ESCAPE key.

Simon Hunt

PHILIPS

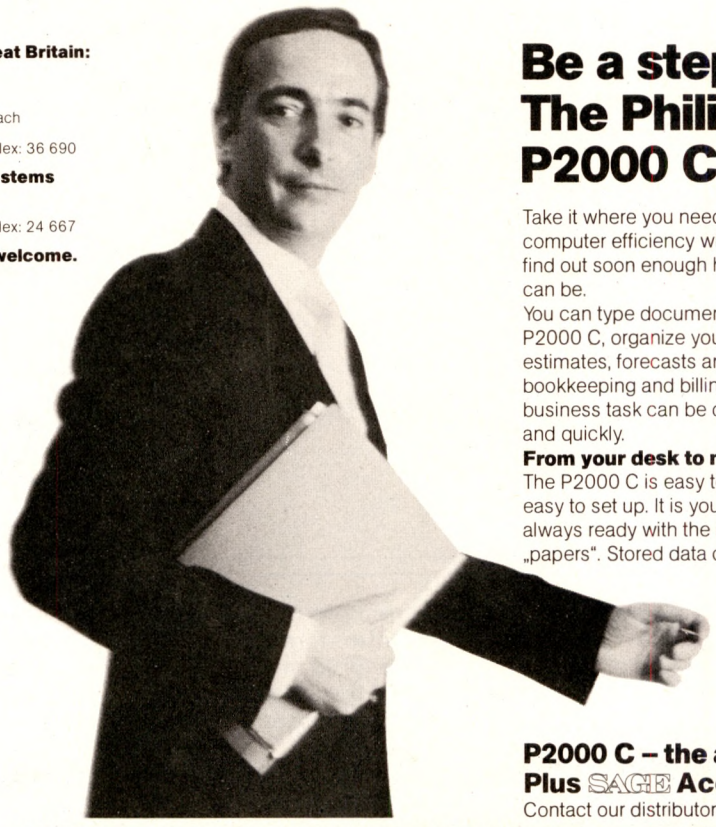
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* CP/M is a trademark of Digital Research Inc.
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apart from REPEAT UNTILs, are the only conditional change in program flow. This makes key program structure:

IF
condition
statements if condition true
END
ELSE
statements if condition false.

This means all statements in the prototype program after an IF statement must be entered into the key twice. This rapidly consumes the 255 byte key memory, so minimise the number of IF statements and make them occur as late as possible in the program. The inverse of this is to move everything you can above the IF statements.

4) **Stand on your head**

Having done all this and put it into minimum abbreviations the program will almost certainly be 280 bytes long. If you now analyse just to save space rather than the program being sensible, headstanding, you may get there. For example, in this program I marks the start address of the line being worked on. But it is not the start address; it is the start address plus one because this saves a few characters in the manipulation.

Des Fisher

```
   10REM DESPACER   des fisher  1983
   20
   30 MODE 7
   40 PRINT''CHR$(141)"DESPACER"
   50 PRINT CHR$(141)"DESPACER"
   60 PRINT'" des fisher  1983"
   70 PRINT''"This programme removes any invisible"
   80 PRINT"spaces at a BASIC programme's line ends."
   90 PRINT"It has cleared all soft keys and set up"
  100 PRINT"user defined key 9 to operate on a"
  110 PRINT"subsequently loaded programme."
  120 PRINT'"To use load the programme to be"
  130 PRINT"despaced and then press f9."
  140 PRINT'"The running total of spaces removed,"
  150 PRINT"ie the number of bytes saved, will be"
  160 PRINT"displayed to show activity."
  170 PRINT'"It has finished when > reappears."
  180
  190REM Clears user keys 0-9
  200 *KEY 0
  210 *KEY 1
  220 *KEY 2
  230 *KEY 3
  240 *KEY 4
  250 *KEY 5
  260 *KEY 6
  270 *KEY 7
  280 *KEY 8
  290 *KEY 9
  300 *FX4,0
  310
  320REM Sets up key f9
  330
  340*KEY9"LOM.=H.-99:?(TOP+1)=4:I=PA.+1:K=0:REP.:M=I+2:S=I+?M+K-1:F=S+?(S+3)-1:REP.:
IF?(I+?M-2)=32?M=?M-1:K=K+1:P.K:U.?(I+?M-2)<>32:F.J=S TOF:?(J-K)=?J:N.:I=I+?M:U.?I=&F
F:END:EL.U.I>0:F.J=S TOF:?(J-K)=?J:N.:I=I+?M:U.?I=&FF:MO.:M"
  350
  360 END
```

BBC random files utility

Random access files on the BBC Micro offer an efficient way of storing large amounts of data and give fast access to this information. Such files can easily form the basis of a data management system. The trouble is that when you wish to review the files to see what is in them it's almost impossible to make sense of the output obtained using the *TYPE command.

If this is used each field is read out backwards and the space fillers on the end of each field cause unwanted linefeeds and the like. The reason for this is *TYPE is designed to work only on ASCII files and not random access ones.

From the instruction book you should be aware that each field in a random access file is preceded by two bytes indicating the type of data stored and its length.

Following these bytes is the data itself written in reverse order. My feeling is that the pointer PTR# actually points to the end of each field as set up on the disk and then reads backwards towards the beginning. However, with ASCII files the pointer starts at the beginning of the disk and continues sequentially to the end thus giving the results described.

To overcome this a short utility program has been written which allows random access files to be printed to the screen, to the printer or copied into an ASCII type file for further use. The latter, for example, can then be operated on by Wordwise.

The program starts by asking for the filename of the file to be printed and checks that it exists on the disk. Note that if it's on drive 0 there is no need to specify the disk number. If it's on another drive then the name format is of the type :2.FILENAME, where :2. indicates the drive number.

Next, it asks for the record length and this must have been specified when the original file was being set up — if you don't know what it is you will have to check back through the original program listing. If you enter the wrong length the program will start to run but will give the error message TYPE MISMATCH. You will then have to restart with the correct length entered.

You are also given the options of dumping the output onto a printer or of spooling the output into an ASCII file. For some reason it

CP/M life saver

With reference to CP/M Hints (Alan Secker, September TJs), suppose you have typed in a program in Microsoft Basic and you then type the Basic command system without first saving the program. System returns you to CP/M from MBasic and you have apparently lost your Basic program. Not so!

If you have previously created a directory entry for a zero length file by SAVE 0 GO.COM, you can now type go in response to CP/M> prompt. The MBasic prompt OK now appears. Type LIST to see your long lost program and then type SAVE.

Paul Kelly

Spectrum audio sensor

The 3.5mm jack sockets, for cassette operation, provide an opportunity to experiment with input/output control at no extra cost. This trick applies to the Spectrum but, theoretically, should work with other machines.

The EAR socket is read by the IN addresses which read the keyboard. In the byte read, D6 (I*IIIIII) represents the value at the EAR socket. This byte is 255 (denary) for no input and 191 if there is a signal at the EAR socket. So if you type and run the following:

```
10 IF IN 65278=191 THEN
     PRINT "RESPONSE,";
20 GOTO 10
```

Then, play a cassette into the computer, as you would for a LOAD, and the computer should respond. Now, leaving the EAR connection intact, plug a microphone into the cassette recorder, insert a blank tape (or push back the record safety lock) and engage record. Suitable noises (a hand clap at four metres or a breath at four centimetres) will now produce the response of your choice.

D Perks

proved impossible to get the *SPOOL command to accept a filename entered as an Input statement—hence the fixed spool filename.

In the REPEAT/UNTIL loop the pointer, PTR, is progressively incremented so as to read out each field in turn. Note that in order to read the first record, PTR#X%=0, I% is set to −1 in line 220.

The use of CLOSE #0 ensures that all files are shut before the program starts and on its completion. Flags are used to indicate the response to various questions and they are initialised early in the program.

John Lewis

```
 10 REM JOHN LEWIS  4/6/83
 20 REM GETS RANDOM FILES AND PRINTS TO SCREEN
 30 SN% = 0   :REM INITIALISE SPOOL FLAG
 40 PO% = 0   :REM INITIALISE PRINT FLAG
 50 CLOSE #0
 60 CLS:PRINT:PRINT:PRINT:PRINT:PRINT
 70 INPUT "File name....." F$
 80 X% = OPENIN(F$)
 90 IF X% = 0 THEN GOTO 400
100 PRINT
110 INPUT "Record Length....."R%
120 PRINT
130 R% = R%+2  :REM RANDOM FILES HAVE 2 BYTES PRECEDING DATA
140  A$ = STRING$(R%,A$) :REM INITIALISE A$ TO LENGTH REQUIRED
150 INPUT "Do you want a printout."PO$
160 IF PO$ = "Y" OR PO$ = "y" THEN PO%=1
170 PRINT
180 INPUT "Do you want to spool..."R$
190 IF LEFT$(R$,1) "Y" THEN GOTO 230
200 REM NOTE NAME OF SPOOLED FILE IS 'INPUT' CHANGE IF NEEDED
210 SN% = 1
220 *SPOOL(INPUT)
230 I% = -1  :REM SO CAN GET FIRST ENTRY WITH PTR = 0
240 IF PO%=1 THEN VDU2
250 REPEAT
260 A$ = ""
270 I% =I%+1
280 PTR#X% = I%*R%
290 INPUT #X%,A$
300 PRINT A$
310 UNTIL EOF#X%
320 IF SN% = 0 THEN 340
330 *SPOOL
340 CLOSE #0
350 VDU3
360 PRINT
370 INPUT "Another file to see.."R$
380 IF R$ = "Y" OR R$ = "y"  THEN GOTO 60
390 END
400 PRINT
410 PRINT "I can't find this file"
420 PRINT "Please check name and disk designation"
430 PRINT
440 INPUT " File name....." F$
450 PRINT : GOTO 80
```

Spectrum renumber

Here's another m/c renumber routine that doesn't affect GOTOs or GOSUBs, but is still a useful tool. It's relocatable so, once saved, can be loaded into any useful space. I usually stick it in the end of UDG. Renumbering starts at 10 with step 10. This can be changed at any time by POKEing; start address+1, first line (and +2 if first line is greater than 255); and start address+18, step (up to 255).

```
5 CLEAR 32499: LET
  a=32500
10 READ d: IF d= -1 THEN
  GOTO 20
15 POKE a,d: LET a=a+1:
  GOTO 10
20 RANDOMIZE USR 32500:
  LIST
25 SAVE "rnr" CODE
  32500,35
30 DATA 17,10,0,42,83,92,
  229,225,114,35,115,35,
  78,35,70,35,9
35 DATA 6,10,19,16,253,
  229,237,75,75,92,63,11,
  237,66,56,230,225,201,
  -1
```

D Perks

CBM to BBC micro transfer

Data and programs can be exchanged between the CBM family and the BBC Micro by means of the User ports. Both machines use the 6522 VIA chip to serve these. On the BBC the complete 'B' side of the VIA, and all its facilities, are available. Unfortunately for our purpose, on the CBM computer the User port does not use a complete VIA port. Part of both the A and B ports are used for other purposes such as the display. This means that the elegant automatic handshake facilities of the VIA cannot be used and the handshake must be handled by the software. The programs transfer data from a disk file on the CBM to a disk file on the BBC. However, there is no reason why they should not be modified for cassette. Equally, once the operation of the programs is understood they can easily be modified to transfer data in the opposite direction—BBC to CBM.

What must be remembered is that the data is transferred byte-wise. If Basic programs are to be transferred they must first be LISTed into an ASCII file. (For example, OPEN 8,8,8, "0: PROGLIST,S,W":CMD8:LIST and then CLOSE8 when done.)

The ports must be interconnected as follows:

A ribbon cable connector will be needed for the BBC end (Radiospares 467-289 fits) and the normal CBM connector for the User port—plus ribbon cable of course.

Connect each of the data lines together. PB0-7 on the BBC (pins 3-10 of the User port—turn the machine upside down, pin 1 is on the top row at the 1MHz BUS end) to PA0-7 on the CBM (pins C-L, bottom row of USER port).

Connect the BBC CB1 (pin 1) to the CBM CA1 (pin B)—this line will be a signal from the CBM to the BBC to indicate that the data is ready on the port.

Connect the BBC CB2 (pin 2) to the CBM CB2 (pin M)—this line will be the signal from the BBC to the CBM to indicate that it is ready to receive data.

Load Program A into the BBC machine. Load Program B into the CBM and RUN. The CBM program will ask for the name of the file to be transferred. Type this in and then RUN the BBC machine. This time the name of the file into which the data is to be put is typed in. Sit back and wait—possibly quite some time. Each byte is taken from the CBM disk and, when the BBC indicates ready, put into the USER port and CB2 set low. The BBC waits for this, reads the User port and sets CB2 high, and sends the byte to its disk. Both machines put the byte onto the screen as well to give you something to look at. The end of the data is indicated by a 255 byte. If your files are binary, beware.

If the file is a Basic program it can then be *EXEC'd into memory and translated into BBC dialect where necessary (using your *PCW* wallchart of course!).

Dr G R Gilmore

```
 10 REM Programs for the transfer of
 20 REM ASCII bytes from CBM computers
 30 REM to the BBC microcomputer.
 40 :
 50 REM-----------------------------------------------------
 60 REM PROGRAM A - BBC program to INPUT bytes from USER port
 70 CLS:INPUT''"Filename",F$
 80 ON ERROR CLOSE#Q%:REPORT:PRINTERL:END
 90 ?&FE62=0              :REM set PB0-7 all inputs
100 C=&FE6C:?C%=240       :REM set control register
110 F%=&FE6D              :REM Interrupt Flag Reg.
120 P%=&FE60              :REM User Port B - data
130 :
140 REPEAT ?F%=255:?C%=208   :REM Set CB2 LOW - Ready for data
150   REPEAT UNTIL ?F% AND 16:REM wait for CB1 to go low - data ready
160   A%=?P%:?C%=240  :REM get data, set CB2 high - i.e. got data (not ready)
170   VDUA%,-10*(A%=13);REM Print to screen (with linefeed if RETURN)
180   BPUT#Q%,A%      :REM Send to disk
190   UNTIL A%=255:CLOSE#Q%
200 END
210 :
220 :
230 REM-----------------------------------------------------
240 REM PROGRAM B - CBM Program to OUTPUT bytes to USER port
250 :
260 INPUT"FILENAME"!F$
270 PRINT"NOW START THE BBC MACHINE"
280 OPEN 8,8,8,"0:"+F$+",S,R":IF DS>19THEN PRINTDS$:END
290 POKE59459,255     :REM SET PA0-7 ALL FOR OUTPUT
300 C=59468           :REM CONTROL REGISTER
310 P=59471           :REM PORT A - DATA
320 F=59469           :REM INTERRUPT FLAG REGISTER
330 :
340 :
350 POKEF,255:POKEC,238     :REM SET CB2 HIGH - DATA NOT READY
360 IF S=64 THEN A=255:GOTO390  :REM END OF FILE
370 GET#8,A%:S=ST:IFA%=""THEN360
380 A=ASC(A$)AND127:IF A<32 AND (A<>13) THEN 360
390 PRINTCHR$(A)!:WAITF,2  :REM WAIT FOR CA1 TO GO LOW - BBC READY
400 POKEP,A     :REM PUT BYTE INTO PORT
410 POKEC,207  :REM SET CB2 LOW - DATA SET
420 IFA<>255 THEN 350
430 POKEC,238:CLOSE8:END
```

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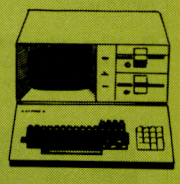
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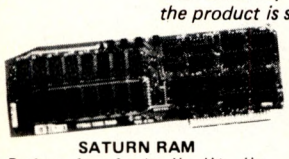
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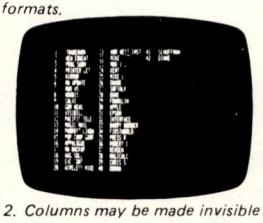
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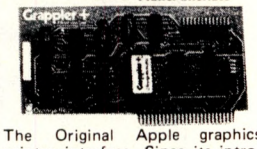
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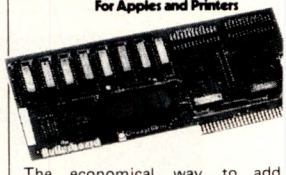
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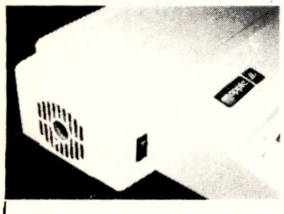
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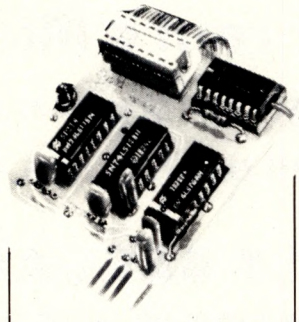


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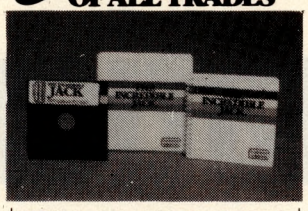
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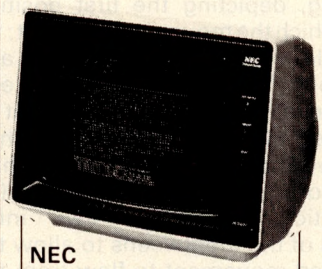
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Micro Animation

Defence departments and Hollywood apart, computer generated animation is in its infancy. The time is ripe for new ideas, and the PCW Micro Animation Competition has been devised as a catalyst to encourage you to get started. Read all about it below.

In the pages that follow, John Melmoth, Hedly Griffin and Jerry Sanders provide you with background information on animation in general and computer animation in particular. There's an animator program from David Harding to give you some ideas on how to write your own competition entry, plus full details of how to enter.

Computer graphics already play a larger part in your life than you may realise. If you watch TV you'll have seen literally dozens of sequences generated with the help of computers. The use of bar charts and pie diagrams on election night shows is probably the most well-known example of how computers are used in television graphics. Another is the manipulation of geometric shapes: the Channel 4 logo is a good example.

Technique

Animation is an extension of graphics, where a still picture is brought to life — the word animate comes from the latin *anima*, meaning soul. Animation is said to go back as early in time as the cave painters. When a fire is lit beneath a cave painting it seems to come alive as the flames dance and flicker. The effect is real enough, and illustrates the very nature of animation: it's all an illusion.

The animation technique used by cartoon and film makers begins with a single drawing, known as a 'key' drawing, depicting the first position from which the movement will start; for example, a man sitting down. This, and a second key drawing of the end position (a man standing up), might be executed by a senior animator. Then 'inbetweens' are drawn (by a junior animator), and a junior artist (an apprentice, perhaps) draws inbetweens of the inbetweens to allow the animated movement to flow from the first key drawing to the last.

If the movement were to last for two seconds, 48 drawings would normally be required since the projection speed of the film is 24 frames per second. Once all the drawings are completed they are traced onto clear acetate sheets, known as cels. The traced image is then filled in with colour paint before being placed over a background, usually a water colour painting, and finally photographed on a rostrum camera. For Disney's *Snow White and the Seven Dwarfs* — one of the very first fully animated colour feature films — four tons of paint and four tons of paper were needed to do the animation.

Computer animation was first presented in the early sixties after John and James Whitney produced graphic images on a mechanical analogue computer. The images were mostly abstract, depicting spiralling patterns and circles. Nowadays, the use of computers in animation is less unusual, and tasks other than image generation are handled. For example, computers are used to control the movements of a rostrum camera. This is a stand with a camera above. Artwork is laid on the stand for filming one frame at a time. Exciting effects are created by complicated moves of the camera and the rostrum table, and these moves may need to be repeated over each frame of film. For such repeated exposures the positioning of the camera and table are critical, and computers are used to control the movements.

Imagine the view from a spaceship as it travels overland at low altitudes or around buildings and skyscrapers. Computers can and do help artists to animate complicated movements by reproducing these movements on a monitor. An input drawing (produced on a digitiser) can be manipulated according to algorithms, which apply rules of geometry and perspective and then display the results on a monitor.

Normally, the computer's projections are plotted frame by frame onto paper, which is then processed by hand for photography using the rostrum camera technique. Don't forget that most of the computer-produced animation you see is actually stored on video tape or celluloid film rather than gener-

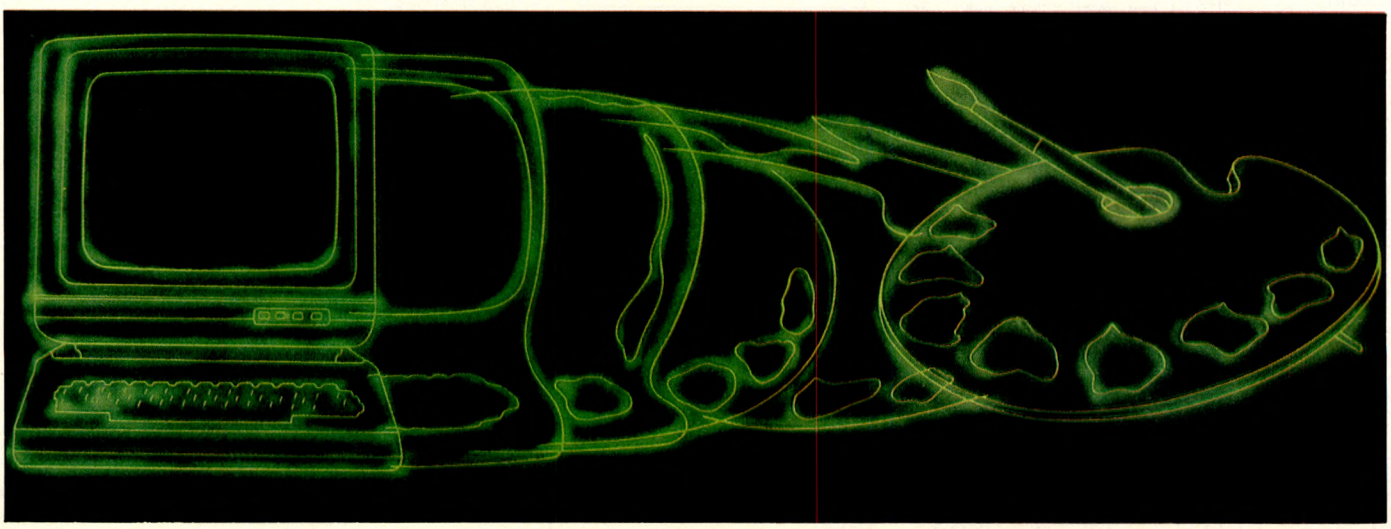
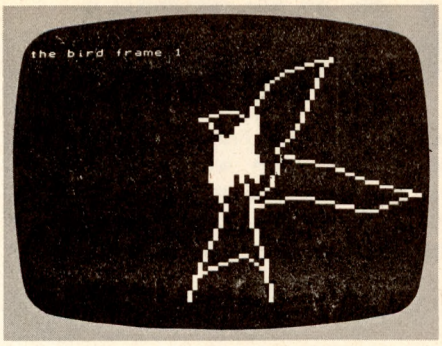
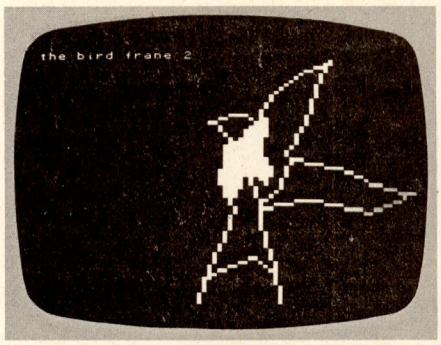
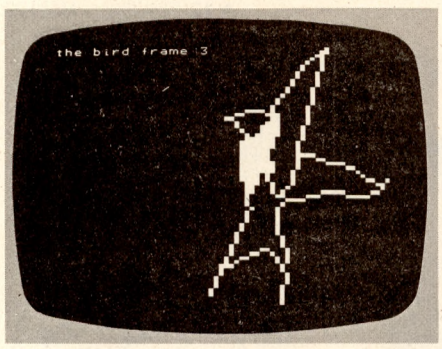
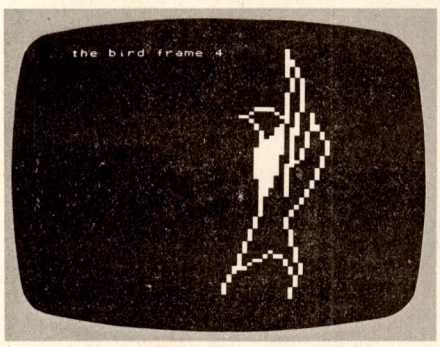


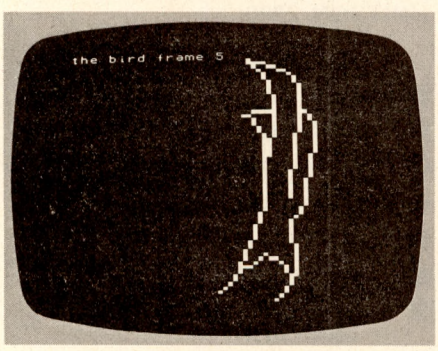
Illustration by Pete Kelly











This sequence of shots shows the wing-flapping motion of a computer animated bird. An illusion of vertical or horizontal movement can be obtained by the inclusion of a frame-to-frame background.

By entering the frame sequence 1-2-3-4-5-5-4-3-2, a continuous loop of bird flight can be obtained.

ated from a program as you watch.

But equipment is available for graphics design (rather than animation) costing as little or as much as you want to spend. A new program for the 48k Oric is claimed to display an object on the screen, enlarge, rotate or shade it, and will cost only £10! A graphics system on a business micro can set you back between £3-20,000, while the Quantel Paintbox used by the BBC for all those election night pie charts and bar diagrams costs over £100,000. These machines have the advantage of images that can be drawn up quickly and so achieve an 'instant professional look.'

Applications

Totally computer-generated animation is a medium which is experiencing something of a protracted adolescence. Pundits find it convenient to speculate on its potential and to gloss its somewhat limited achievements. Expensive, high resolution graphics have not so far established an idiom. The most conspicuous successes have been the Death Star briefing in *Star Wars,* about 30 minutes of *Tron* (*all* of which was processed by computer but only 30 minutes was computer-generated) and, reportedly, NYIT's (New York Institute of Technology) science-fiction film *The Works,* which may never be finished due to financial difficulties.

In 1974 the directors of the International Animated Film Association commissioned a book, *Computer Animation,* 'to assist and acquaint all those who are interested in the subject.' This book predicted an immediate and rapid rise in the number of computerised applications within the field of studio animation.

In 1981 Dr Edwin Catmull, founder of the New York Institute of Technology's Computer Graphics Laboratory, and now employed by Lucas Film (the *Star Wars* people), contributed an essay to a Film Symposium entitled *Computer Character Animation — Is it Possible?.* Conceding that the previous ten years had seen important advances, particularly in the areas of resolving the 'hidden surface problem,' developing more sophisticated frame buffers and relieving commercial colour control headaches, Catmull nevertheless feels that initial expectations have not been entirely lived up to.

There are systems capable of real time animation in full colour with several characters, lip synchronisation for speech and complex 'live' backgrounds, but they are beyond all but American military or Hollywood budgets. Using a Cray or a Vax computer is expensive, perhaps £1000 per second of film produced.

One of the principle reasons for the apparently restricted success of commercial computer animation is that clients and sponsors have a limited concept of the computer's abilities, and insist on something typically 'high tech'. They are not that interested in promoting computer-generated photographic realism as in maximum impact, abstract and futuristic pieces with titles like *Snowflake, Explosion, Twin Helix* and *Nebula.*

Among the numerous applications of computer animation are engineering, motion analysis, air traffic simulations, Computer Aided Design, teaching aids . . . The American Army's training and doctrine command (TRADOC) has just completed an extensive study of arcade games technology and its possible adaption for training purposes. Under contract to TRADOC, Atari has modified the best-selling 'Battle Zone' and created a scenario in which the controls and weapons of the M2 infantry vehicle have been simulated. The Army also has plans to provide mess rooms in which soldiers will be encouraged to play video games based on the M60 and M1 tanks.

Competition

The competition is for a) animator programs and b) animated sequences. In the animator section we are looking for two kinds of program. The first will enable a user to build an animation sequence (David Harding's NewBrain program, featured below, is a good example). The second will allow the user to input an image and then manipulate it to give frames that may be captured from the VDU and recorded, either on film or videotape.

In the sequence categories we are looking for VDU, film or video animation generated entirely by microcomputer. The duration of these sequences can be a few seconds, a continuous loop, or as much film action as you can generate within the competition rules.

A simple animator program will allow a drawing to be copied automatically from one 'pad' to another. The copy can then be modified and copied in turn to the next pad for further modification, and so on. More complex algorithms would be needed to manipulate images.

In the animator section your program may have to reconfigure your keyboard to accept drawing commands or else use a peripheral device such as a drawing tablet or joystick. Routines to save drawings to tape or disk, load them back into memory and preview animation will also be needed. Full details of rules and requirements are given at the end of this article, but to give you a few more ideas, see Dave Harding's animator program for the NewBrain in Fig 1. If you have another computer you will find some useful ideas in Dave's program which may help you when designing your own animator.

NewBrain animator

With this program you can produce short sequences of pictures on a

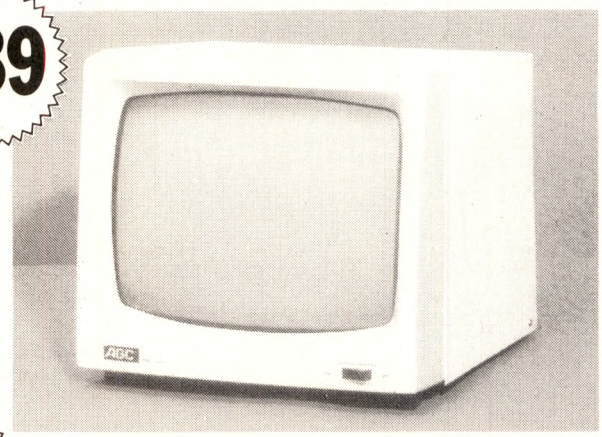
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NewBrain computer, display them in any chosen order and set the time lapse between each picture (or frame). In order that the motion you produce flows smoothly, the program incorporates a routine to copy a picture from a start frame to a destination frame. The destination picture can then be subjected to small changes and copied in its turn to the next frame. Repeating this process ensures that the immovable bits of the drawing stay in the same place on the screen. You'll be able to save pictures to tape and call them up again.

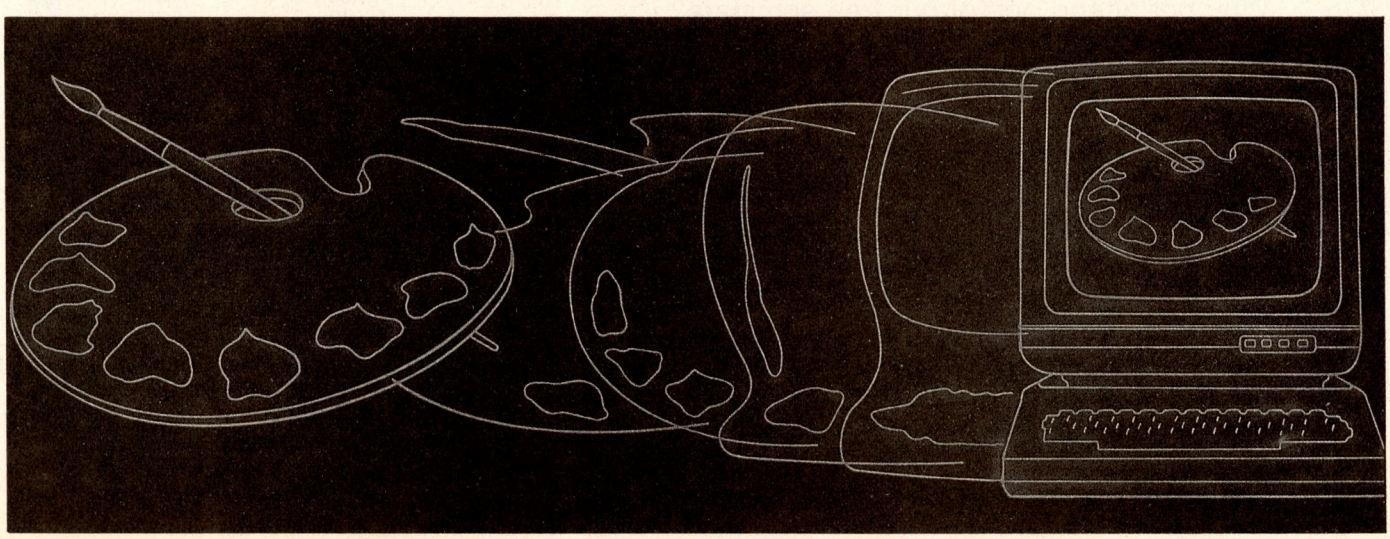
Program Description

The program itself is fairly simple: the NewBrain Basic does all the hard work. In particular, the multiple stream facility enables you to store several pages at once and to flicker between them with no interference on the screen. I'm not a technical expert, but I imagine this must be achieved by giving the output hardware the RAM address of each page as it calls for a new one — this would avoid having to move large chunks of RAM around.

To use the program, you'll first need to open some new frames or erase the drawings on old ones after you've recorded them on tape. Do this from the main menu by selecting option 1. After creating and naming the frames (subroutine beginning at line 500) you will be returned to the main menu. Choose option 2 and then enter the number of the first frame.

To start drawing, press Newline. Use the cursor arrows first and you'll get a white line. Now try typing some letters — these will appear and the character cursor (as opposed to the pen) will move one place to the right. The pen will move two places to the right, without drawing, at the same time. You cannot draw over the characters with the pen (except over the space character), but you can place characters over lines or pen marks. To move the cursor without drawing press 'video text'. Only the cursor control arrows will now move the pen. If you want to check its position, use the 'insert' key to light it up briefly: when you are in position to

```
1 REM **ANIMATOR  by David Harding**
2 REM **                           **
3 REM **All '£' signs should be    **
4 REM **       typed as hashes     **
5 REM **                           **
6 REM *******************************
9 REM master routine
10 INPUT("long or short screen -long is most
      convenient (l/s)")ls$
20 IF ls$="l" THEN OPEN£0,0,"l"
30 IF ls$="s" THEN OPEN£0,0
40 DIM na$(20)
50 PUT£0,31
60 PRINT "1. open new 'frames'"
70 PRINT "2. draw on frame"
80 PRINT "3. copy one frame to another"
90 PRINT "4. load frame from tape"
100 PRINT "5. store frame on tape"
110 PRINT "6. clear frame"
120 PRINT "7. flash between frames"
130 INPUT ("input option ") op
140 IF op>7 OR op<1 THEN 50
150 ON op GOSUB 500,2000,3000,4000,5000,6000,7000
160 GOTO 50
500 REM opens new frames
505 PUT£0,31
510 PRINT "you have ";nf;"frames"
515 INPUT("how many more frames wanted? type 0 for none, a -ve no.
   to lose       frames ")no
520 nf= nf+no
535 IF nf<0 THEN PRINT" -ve no of frames" :nf=nf-no :GOTO 510
540 IF no>=0 THEN 600
550 FOR i=1 TO (-no)
560  CLOSE£(nf+i)
570 NEXT i
580 RETURN
600 FOR i=(no-1) TO 0 STEP -1
605 ON ERROR GOTO 900
610  CLOSE£(nf-i):OPEN£(nf-i),0,(nf-i)
615  ON ERROR GOTO 0
617  PUT£(nf-i),23,0
620  PRINT "input a name for frame ";(nf-i);
630  INPUT na$(nf-i)
635 PRINT"remaining bytes = ";FREE
640 NEXT i
650 INPUT ("press 'newline to continue' ")a$
660 RETURN
900 IF ERRNO<>100 THEN REPORT
910 PRINT "'insufficient memory' error - you only have "
   ;(FREE);" bytes left"
920 nf = nf-i-1
930 PRINT "program will go slow unless >=2 frames are closed !"
940 ON ERROR GOTO 0
950 i=0
960 RESUME 640
1000 REM plotting routine
1010 REM i/p s=stream no. x=x coord. y=y coord. xy=character to
     be plotted (1=white pixel ,0=black pixel,other=character)
1020 xp=INT(x/2):yp=INT(y/3):ri=0
1025 IF xy>1 AND xy<256 THEN ri=2:GOTO 1100
1027 IF xy<0 OR xy>255 THEN RETURN
1030 PUT£fr,22,(xp+1),(yp+1),20:GET£fr,ch
1040 IF ch>127 AND ch<160 THEN ch=191-ch:GOTO 1900
1050 IF ch<32 THEN GOTO 1900
1060 IF ch=32 THEN ch=0:GOTO 1900
1070 IF xy=0 OR xy=1 THEN RETURN
1100 PUT£fr,22,(xp+1),(yp+1),27,xy
```



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```
1105 IF x<78 THEN x=x+ri
1110 RETURN
1900 po=x-xp*2+2*(y-yp*3):cg=ch
1905 zz=2^po
1910 cg=INT(cg/(2^po))
1935 cg=cg-INT(cg/2)*2
1940 IF cg=0 AND xy=1 THEN ch=ch+zz
1942 IF cg=1 AND xy=0 THEN ch=ch-zz
1945 xy=ch
1947 IF xy>31 THEN xy=191-xy
1948 IF xy=0 THEN xy=32
1950 GOTO 1100
2000 REM to draw on a frame
2005 CLOSE£200:OPEN£200,5
2010 INPUT ("input frame number (enter '0' for directory) ") fr
2015 IF fr=0 THEN GOSUB 10000:GOTO 2010
2020 PUT£fr,12:PRINT£fr,na$(fr);
2030 INPUT£fr,a$
2100 REM drawing routine
2105 x=5:y=5:co=1:dr=1
2110 GET£200,ke
2112 xy=co
2120 IF ke=13 THEN RETURN
2130 IF ke<>8 AND ke<>11 AND ke<>10 AND ke<>26  THEN 2170
2135 IF ke=8 AND x>0 THEN x=x-1:GOTO 2900:REM left
2140 IF ke=11 AND y>0 THEN y=y-1:GOTO 2900:REM up
2150 IF ke=10 AND y<71 THEN y=y+1:GOTO 2900:REM down
2160 IF ke=26 AND x<79 THEN x=x+1:GOTO 2900:REM right
2165 GOTO 2900
2170 IF ke=23 THEN co=1 :GOTO 2110:REM white
2180 IF ke=2 THEN co=0 :GOTO 2110:REM black
2190 IF ke=0 THEN dr=1-dr :GOTO 2110:REM dr=1-draw ,dr=0-move
2200 IF ke<>17 THEN 2300:REM insert
2205  xp=(INT(x/2)+1):yp=(INT(y/3)+1)
2210  PUT£fr,22,xp,yp
2220  PUT£fr,20:GET£fr,ch
2222  IF ch=0 THEN ch=32
2223  IF ch>127 THEN ne=ch-128
2225  IF ch<128 THEN ne=ch+128
2227  IF ne=0 THEN ne=32
2230  PUT£fr,22,xp,yp,27,ne
2240  FOR i= 1 TO 100 :NEXT i
2250  PUT£fr,22,xp,yp,27,ch
2290 GOTO 2110
2300 REM this is line 2300 !
2390 xy=ke
2890 xy=ke
2900 IF dr=1 GOSUB 1000
2950 GOTO 2110
2990 RETURN
3000 REM copies one screen to another
3005 PUT£0,31:PUT£so,12:PUT£de,12
3010 INPUT("input source frame (enter '0' for directory) ")so
3015 IF so=0 THEN GOSUB 10000:GOTO 3010
3020 INPUT("input destination frame (enter '0' for directory) ")de
3025 IF de=0 THEN GOSUB 10000:GOTO 3020
3027 IF nf<so OR nf<de THEN ?"you only have ";nf;" frames":GOTO 3010
3030 FOR j=1 TO 24
3040  FOR i=1 TO 40
3050   PUT£so,22,i,j,20
3060   GET£so,ch
3065   PUT£so,26
3070   PUT£de,22,i,j,27,ch
3080  NEXT i
3090  PUT£so,28,10:PUT£de,28,10
```

carry on drawing, return to the drawing mode by pressing video text again: this acts as a toggle in and out of drawing mode.

So far you have been drawing in white. By pressing Control and R together you change the pen colour to black — this is useful for editing out unwanted lines. Control and W together revert to a white pen. To return to the menu press 'Newline'.

Drawing Technique

It's a good idea to make a sketch on paper before you start if you want to get best results. I did my bird drawings using 'light and shade' rather than line drawing — graph paper could be useful for planning where to draw the blobs. This is the way newspaper pictures are made up: try looking at one under a magnifying glass. To draw diagonal lines, press the key video text/cursor down (or up)/video text/cursor across right (or left)/video text/cursor down . . . and so on.

Frame copying

Having returned to the menu, select option 3. Give the source and destination frame numbers when prompted and the new frame will (slowly) appear. Then edit the copy. It's best to add to the old picture *before* erasing unwanted lines with the black pen. Check each movement as you go. For the bird, I edited one wing and then checked its movement by going to the flicker option and flickering between the old and new frames. Small adjustments may then be needed to keep the movement smooth — once you've made a mistake it will carry forward to all the subsequent frames! When the second picture is perfect, copy it to the third and start work on that.

Flickering technique

The speed option is only calibrated for seconds, and the fastest speed is achieved by entering '0' in response to the speed prompt. Experiment with the picture order: I found that repeating frame 5 in mid-sequence gave a smoother motion. Although you may only draw a limited number of frames



```
3100 NEXT j
3110 RETURN
5000 REM stores frames on tape
5010 PUT£0,31
5020 PRINT"stores frames on tape"
5030 PRINT"enter frames to be saved (enter '0' for directory)"
5040 INPUT("from ") bt
5045 IF bt=0 THEN GOSUB 10000 : GOTO 5040
5050 INPUT("to ") tp
5055 IF tp=0 THEN GOSUB 10000 : GOTO 5050
5060 ns=tp-bt
5070 IF bt<0 OR ns<0  THEN RETURN
5080 IF tp>nf THEN PRINT"you only have ";nf;" frames":GOTO 5040
5090 INPUT("do you want to position tape (y/n)  ")ye$
5100 IF ye$="y" THEN GOSUB 5900
5110 INPUT("press record on tape 2 then type newline ") a$
5120 FOR fr=bt TO tp
5125 n=0
5130  CLOSE£201:OPENOUT£201,2,"animation frame"
5180  FOR j=1 TO 24
5190   FOR i=1 TO 40
5200    PUT£fr,22,i,j,20
5210    GET£fr,ch
5230    PUT£fr,26
5240    PUT£201,ch:n=n+1:PUT£fr,12:PRINT£fr,n
5250   NEXT i
5260   PUT£fr,28,10
5270  NEXT j
5280  ns=ns-1
5285  CLOSE£201:CLOSE£201
5290 NEXT fr
5300 RETURN
5900 PRINT"type * when positioned"
5910 ON BREAK GOTO 5920:CLOSE£201:OPENIN£201,2,"I hope you haven't
    a file named this"
5920 ON BREAK GOTO 0
5980 CLOSE£201
5990 RETURN
6000 REM clears frame
6005 INPUT("input frame number (0 for directory) ") fr
6007 IF fr=0 THEN GOSUB 10000:GOTO 6005
6010 INPUT ("do you want a white or black screen (w/b) ")co$
6020 IF co$="w" THEN 6500
6030 REM black screen
6040  CLOSE£fr:OPEN£fr,0,fr:PUT£fr,23,0
6050  PRINT£fr,na$(fr)
6060 RETURN
6500 REM white screen
6505  PUT£fr,12
6510  FOR i=1 TO 24
6520   PRINT£fr,""
6530  NEXT i
6540  PUT£fr,12
6550  FOR i=1 TO LEN(na$(fr))
6560   PUT£fr,ASC(MID$(na$,i,1))
6570  NEXT i
6580 RETURN
7000 REM flash between frames
7010 INPUT ("enter how many frames ") qf
7015 IF di=0 THEN 7025
```

because of memory limitations, you can flicker them as often as you like. I found that by entering the frame sequence 1-2-3-4-5-5-4-3-2 I could obtain a continuous loop of bird flight. A further enhancement would be to include a background and change it from frame to frame to give the illusion of vertical or horizontal movement, in addition to the flapping of wings in the foreground.

Crashing

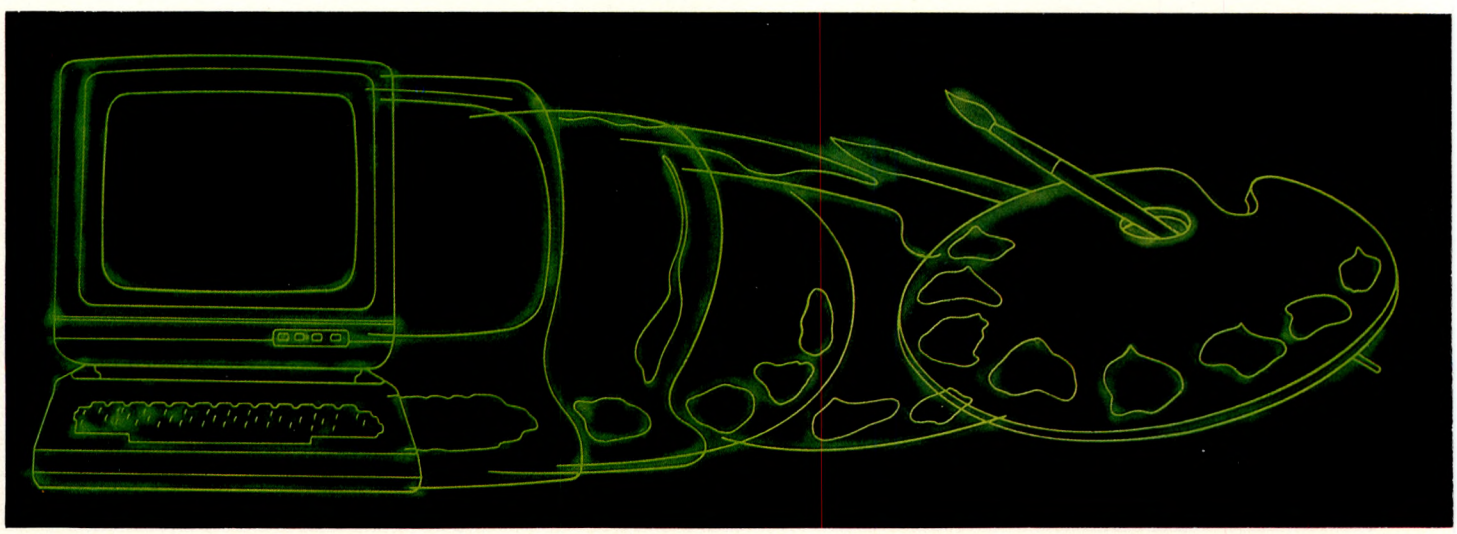
As long as you're reasonably careful with the program it shouldn't crash. The stop key should only be used in dire circumstances. GOTO 50 will take you back to the menu without losing anything but may cause problems later on because flags have not been correctly set. RUN will lose all the variables, so although the frames will still be open, the number of open frames will no longer be stored. If you accidentally type RUN, press Stop to come back out of the program and type:—
bt = ((bottom frame number))
tp = ((top frame number))
GOSUB 4090
This will save the open frames on tape drive 2.

Rules and categories

Competition Entry Categories
1. ANIMATOR PROGRAMS
2. VDU ANIMATION SEQUENCE (STANDARD MACHINE)
3. VDU ANIMATION SEQUENCE (NO MEMORY LIMIT)
4. FILM SEQUENCE

In each category, entries will be accepted from:
a) Individuals/private groups
b) Schools

CATEGORY 1a:
ANIMATOR PROGRAMS (STANDARD MACHINES)
RULES
1. This category is for a program or suite



C·O·M·P·E·T·I·T·I·O·N

of programs which may be written in machine code, assembly language and/or any high level language.
2. The program(s) must run on standard unexpanded machines. For those machines which offer different RAM versions (Spectrum, Lynx, Sirius, etc), the judges will take the version used into consideration when evaluating the program(s).
3. The program will enable a non-programming user to carry out the following operations:
   a) Draw onto the VDU using the keyboard or joystick.
   b) Display on the VDU an animated sequence created by the user.
   c) Save the animation to tape or disk.
   d) Load the animation from tape or disk for view/modification.
4. You will be judged on (in no particular order):
   1. Ingenuity and originality of the code.
   2. Efficiency of the code.
   3. Effective use of the machine's capabilities.
   4. User-friendliness
   5. Readability of code.

CATEGORY 1b:
IMAGE MANIPULATION PROGRAMS
RULES

1. This category is for a program or suite of programs which may be written in machine code, assembly language and/or any high level language.
2. The program(s) may run on expanded machines and may involve the use of digitising equipment (graphics tablet, etc.)
3. The program will enable a non-programming user to carry out the following operations:
   a) Input a drawing to the program.
   b) Display manipulated versions of the drawing on the VDU for frame by frame capture on film or video tape.
4. You will be judged on (in no particular order):
   1. Ingenuity and originality of the code.
   2. Efficiency of the code.
   3. Effective use of the machine's capabilities.
   4. User-friendliness.
   5. Readability of code.

CATEGORY 2:
VDU SEQUENCES
(STANDARD MACHINES)
RULES

1. In this category machines may be expanded up to a maximum of 128k RAM.
   No other modifications to standard machines are permitted.
2. An entry in this section will do the following:
   a) Allow the sequence to be loaded from tape or disk.
   b) Permit the judges to repeat view from the keyboard.
3. Sequences will be judged entirely on artistic merit in the context of the capabilities of the chosen machine.
4. The sequences must run on standard machines. Entries for the Sirius or IBM will be judged in monochrome only.

CATEGORY 3:
VDU SEQUENCES
(NO RESTRICTIONS)
RULES

1. In this category no hardware holds are barred.
2. Entries will be judged entirely on artistic merit.

CATEGORY 4:
FILM SEQUENCES

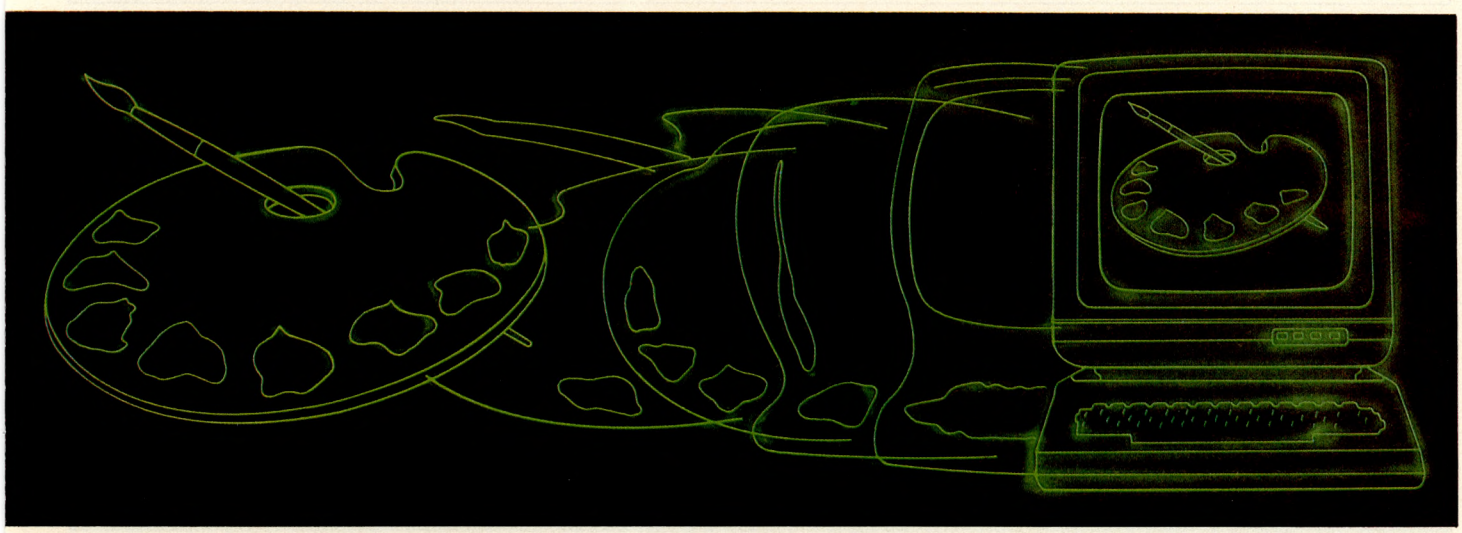
1. Submissions will consist of a single reel of 8 or 16mm film or a single video cassette.
2. All frames on an entry must be computer-generated images. Winning entrants may be required to demonstrate the techniques used.
3. A paper detailing the program(s) and filming techniques used must accompany each entry.

CATEGORY 5:
SPECIAL CATEGORY
RULES

1. As microcomputer animation is a relatively new field, we understand there may be entries which contribute new insights into the subject but which fall outside the categories we have drawn up for the competition. Category 5 entries will be those which, because of their innovative nature, deserve special mention. Nominations for this category will be made by the judges only.

General competition rules

1. Any entry which contravenes any or all of these rules will be disqualified.
2. Entries must be submitted in an evelope clearly marked ***PCW*** **MICRO ANIMATION COMPETITION**.
3. Program entries shall consist of three copies of the material on disk or cassette. The software shall be labelled, stating format, baud rate, hardware requirements (including RAM) and any other relevant data.
4. Film and video entries shall consist of one copy of the material, fully labelled.
5. Comprehensive and legible documentation shall be included with each entry.
6. For entries in Category 1a or 1b a full listing must be enclosed.
7. Each entry shall be accompanied by a completed entry form (not a photocopy) from *PCW*. Entry forms will be published in three successive editions of *PCW*, beginning February 1984. All entry material received after 15 July 1984 will be deemed ineligible.
8. Employees of VNU Business Publications and/or their relatives are not eligible to enter.
9. *PCW* reserves the right to declare any category vacant if no entry of sufficiently high standard is received.
10. In the above and in all matters relating to the competition the judges' decision is final. No correspondence will be entered into.



```
7020  CLEAR ff():di=1
7025 DIM ff(qf)
7030 FOR ii= 1 TO qf
7040  PRINT"enter no. of frame  ";ii;" (enter '0' for directory) ";
7050  INPUT ff(ii)
7055  IF ff(ii)=0 THEN GOSUB 10000 : GOTO 7040
7060 NEXT ii
7065 PRINT"to stop flashing press any key"
7070 INPUT("enter flash up delay in seconds ") fd
7075 IF fd<.01 THEN fd=.01
7080 CLOSE£204:OPEN£204,6,204
7090 FOR i=1 TO qf
7100  PUT£ff(i),12:PRINT£ff(i),na$(ff(i))
7110  FOR j=1 TO 120*fd
7120   GET£204,ke
7130   IF ke<>0 THEN j=fd*120:i=qf
7140  NEXT j
7150 NEXT i
7152 IF ke=0  THEN 7090
7160 CLOSE£204:CLEAR ff()
7170 RETURN
10000 FOR i=1 TO nf
10010  PRINT i,na$(i)
10020 NEXT i
10030 RETURN
20000 REM end of program
```

Fig 1. Animator program for NewBrain by Dave Harding

PCW MICRO ANIMATION COMPETITION

ENTRY FORM

Category entered (one per entry form)

Please tick
1a. Animator program ☐
1b. Image manipulator program (digitiser use) ☐
2. VDU sequence (limited memory) ☐
3. VDU sequence (unlimited memory) ☐
4. 8 or 16mm film sequence ☐

Name of entrant (or school entry project leader)

.....

School (if school's entry) .....

.....

Address for correspondence .....

.....

.....

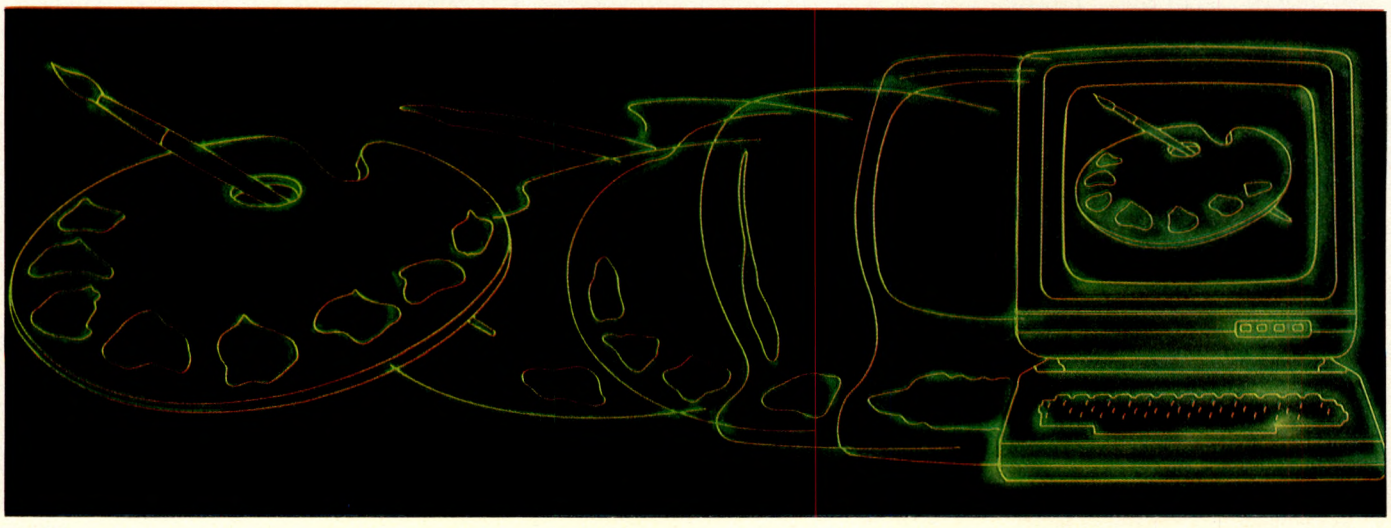
Telephone number (day) ..... (evening) .....

If Category 2, 3 or 4 state sequence title .....

Machine ..... RAM (if appropriate)

Newbrain Animator: variables used

ls$	—long (80 column) or short (40 column) screen
na$	—holds frame names
op	—holds menu option chosen
nf	—number of frames opened
no	—number of new frames opened
x	—pen x coordinate
y	—pen y coordinate
xy	—pen colour (1=white, 0=black, other=character value)
xp	—character x coordinate
yp	—character y coordinate
ri	—moves pen two to the right if character pressed
ch	—original character at plotting /pen position
po	—position of pixel inside character
cg	—temporary store for character
zz	—binary position at pixel inside character—see character codes for character set 1
fr	—present frame number
dr	—draw flag : 1-drawing mode, 0-non-drawing mode
ke	—key pressed in drawing routine
so	—copy source frame number
de	—copy destination frame number
bt	—load/save bottom frame number
tp	—load/save top frame number
nl	—number of frames to be loaded
ns	—number of frames to be saved
ye$	—yes or no
n	—saving, position counter
co$	—colour of clear frame—white or black
qf	—quantity of flicker frames
ff()	—frames to be flickered (in order)
di	—has ff() been dimensioned—that is does it need clearing? 1=yes, 0=no
i,ii,j, a$	—general purpose variables.



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9. American Bowling
10. Vicious Viper
11. Gate Crasher + Jungle Jinks
12. Le Mans Turbo
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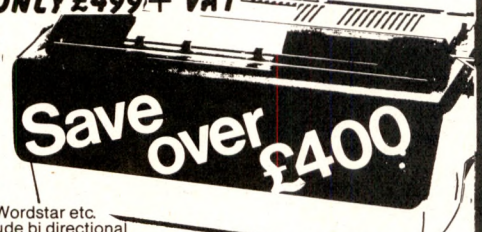
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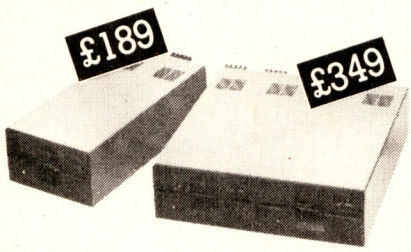


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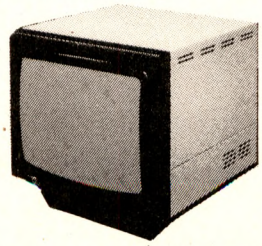
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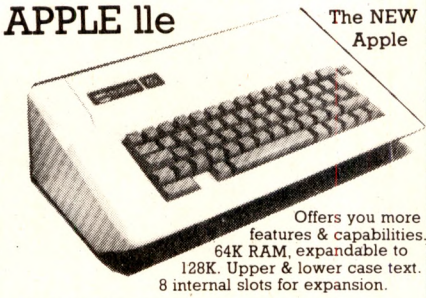
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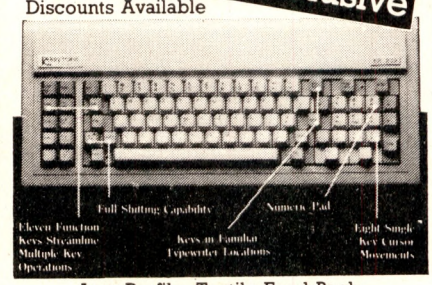


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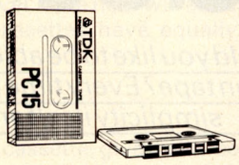
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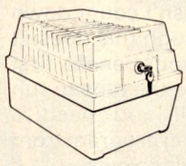
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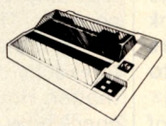
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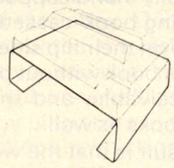
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Fig 1 BBC index prompting program

Get it in one

Would you like to be able to pinpoint exactly where your program is on tape? Every time? Well, now you can. Clive Hood's idea is simplicity itself and you can put it into effect right away.

If you read the manual supplied with your micro, you'll quite possibly come across a line like 'Each time a cassette is used it must be fully rewound and the counter reset to zero . . .' or else '. . . leave a large blank space between programs'.

It was when I was frustrated at this vagueness and time-wasting that I happened upon Radio 4's *In Touch* feature. The programme, intended for the visually handicapped, mentioned that 'talking book' cassettes have page numbers on their flip sides. If you think about it, a book without page numbers is inconceivable, and that applies to talking books as well.

The result is that the working side of the tape runs one way and the index side flows in the opposite direction and so has to be numbered backwards.



Illustration by Ingram Pinn

one like this: 359 . . . 358 . . . 357. . .

Another way is to use the micro itself (isn't that what you bought it for?). On the BBC with its built-in real time clock, an index prompting routine (see Fig 1) will tell you not only which number to dictate, but when to dictate it. (*Editor's note: micros without clocks could use an interrupt-driven routine: see* PCW *June '83, p172, for a (NewBrain) example.*) Notice that for our purpose the timing of the indexing is immaterial: aim for a new number every two seconds. The purists among you might object if the index doesn't count down to exactly nought, though this doesn't matter. However, for your benefit, first check how long it takes the tape to run from end to end. If you need a stopwatch, the following program from the BBC User Guide will do nicely:

> *'. . . the advantages of indexing far exceed one's expectations. In particular, there is no longer any need for lengthy rewinds; one moves from wherever the tape was last used.'*

Any length of cassette may be used, but for our purposes it is best to keep to this advice: go for good quality short tapes, the C12 size will hold a lot of information.

The spoken index takes up the whole of one side of the tape — which may at first appear a waste. But — as you will discover — the advantages of indexing far exceed one's expectations. In particular, there is no longer any need for lengthy rewinds; one moves from wherever the tape was last used. Provided a simple routine is adhered to, there is never the slightest doubt exactly where to record the next SAVE.

Preparing the index

Using the cassette player's built-in condenser microphone or, if you have one, a hand-held mike, dictate a descending series of numbers along one side of the tape. There are two ways you can do this without fluffing it. Using my Casio HL-807 pocket calculator, take advantage of its 'K' constant feature, I key 1 – – 360, whereupon each time I press 'equals' the display steps down

```
5 CLS
10 T=TIME
20 PRINT TAB(10,12);(TIME – T)/100;
30 GOTO 20
(press ESCAPE to halt)
```

An actual example is as follows: the tape ran for 7¾ minutes. Multiply by 60 gives 465 seconds. Divide by (= seconds per number) 1½ which gives 310 as the first number, so edit line 40 of the INDEX program to read:

```
40 FOR E=310 to 0 STEP –1.
```

What matters is, whether you count down to zero or not, that every one of the index numbers has an exactly corresponding spot on the working side of the tape.

It is worth doing this job clearly and well, because it only needs to be done once: all your other cassettes may be indexed by copying from the master index. This requires a second cassette player which you should be able to beg or borrow (I don't hold with stealing!). The two are linked by a cable with a plug at each end (use your computer's own cassette cable) taking the output from the transmitting machine's Monitor



socket to the other's Record socket. To preserve good sound quality be sure to set the transmitting machine's output to a low level. Care here will ensure that all your cassettes have equally good indices.

In use

To use the cassette, give the three plugs at the cassette player end the following treatment:

RECORD. (Stays put).

REMOTE. (This is the switching circuit that starts and stops the motor. Normally this plug should be partly withdrawn to allow the cassette to operate in playback mode. In fact, I have soldered a push-button switch (push for on) into the flex between the computer and the cassette player to give instant control).

MONITOR. (Partly withdraw this plug in order to read the index. Once again I have in fact shunted the jack circuit's terminals with a variable 'pot' resistance so as to leak a few milliamps to the speaker, so my plug stays put).

Keep a notebook in which one page is devoted to each cassette, or else write (neatly) on the cassette sleeve. To LOAD an indexed program, look up its index and position the tape two numbers below that. Invert the cassette, and there will then only be three or four seconds to wait before the VDU signals that it has found the program.

To SAVE, position the tape two numbers higher than the number following the end of the last run program. Turn the tape over and away you go (don't forget to make a note of the number).

I continue to experience what a great help this system is. Recently, I was expecting two knowledgeable friends to visit me so I could demonstrate three of my programs which were among other programs on three separate cassettes. Before my visitors arrived I was able, with very little effort, to pre-position each tape so that each load started within seconds of issuing the command. Apart from the great saving of time and the near impossibility of making a mistake, there is the satisfaction of a system that *looks* as efficient in practice as it sounds.

```
 10 REM **INDEX prompt** C Hood
 20 REM Edit line 40 to whatever range
    of numbers
 30 REM you require, eg, E=360
 40 FOR E=12 TO 0 STEP-1
 50       F=TIME+150
 60       REPEAT UNTIL TIME>=F
 70       IF E<0 THEN 120
 80       CLS
 90       VDU 23;8202;0;0;0;
100       PRINT TAB(9,12)E
110 NEXT
120 VDU7
130 END
```

Fig 1 BBC index prompting program

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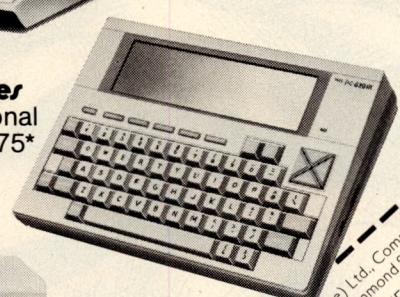
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EXPANDING ATOM BASIC

Make the Basic of your Acorn Atom more powerful by adding your own instructions to an expansion dictionary, as described by Vincent Fojut.

Much has been written recently about the considerable attractions of user extensible languages. Indeed, many Basic coders may feel quite disadvantaged when faced, for example, with their Forth-wielding brethren. But help is at hand. The following article describes a program, written for the Acorn Atom, which brings Atom Basic a little closer to the Forth-like ideal of infinite expandability. A machine code routine can be assigned a name, added to an expansion dictionary, and then used like any other Basic command.

Background

On the Atom, most low level operating system functions (for example, reading and writing characters) are accessed via a set of vectors held in RAM. Any calls to these routines are effectively indirect subroutine jumps to the address stored in the appropriate vector. This provides a simple means of tweaking certain aspects of Atom Basic. Various enhancements or modifications are possible, by changing the default address in a given vector to one which points to a user defined machine code routine. Of course, whenever the BREAK key is depressed (causing a system reset), the new address is overwritten by the original, and consequently needs re-initialising. This is a minor inconvenience, however, and is a small price to pay for the potential of customisation. The above technique provides the necessary hooks required to link-in our expansion program, as we shall see.

Program operation

As shown in listing 1, the expansion program makes extensive use of the Atom's excellent built-in assembler (sadly under-used by many). For those who are either unfamiliar with 6502 assembly language, or just plain curious, an explanation of the inner workings is provided below.

Normally, whenever the Atom cannot find a command in its Basic vocabulary, it performs an indirect jump, via the error vector at locations #202 & #203 (also referred to as BRKVEC). This vector normally points to the standard error handler at #C9D8.

The code at label ZZ0 sets up the vector to point to a new routine, starting at label BB0 (the expansion program proper). However, this alone is not sufficient to ensure that the new expansion program will be invoked. Not only is the error vector reset by BREAK (like all other vectors), but the standard Atom read character routine (OSRDCH), whenever called, also resets the error vector to #C9D8. Consequently, the OSRDCH vector at #20A, #20B also needs to be changed, so that a new read character routine can ensure that the error vector is not overwritten. Line 240 sets up the OSRDCH vector to point to new code, starting at label LL0.

With the above modifications, whenever a command cannot be found in the standard vocabulary, the Atom now jumps to our expansion program. This checks for a match in the expansion dictionary. If a match is made, the machine code routine, at the address specified in the dictionary, is executed. If no match exists, the program checks for the presence of a tool-kit or other utility ROM at #A000-#AFFF. This is achieved simply by examining certain addresses, within the above range, for the appropriate byte values. As written, the expansion program checks for the existence of the Program Power toolkit. By changing the values compared on line 500, any make of utility ROM can be detected. Only if no match is found at this stage, does the expansion program finally give up (having done all it reasonably can), and jump to the standard error handler at #C9D8.

Creating new commands

Now that we are familiar with the mechanism by which new commands can be added to Atom Basic, how are they entered into the expansion dictionary in the first place? The magic ingredient is the first of our new commands, called 'WORD'. This is a machine code routine (starting at label RR0 — see line 530) which allows new commands to be defined. It can be considered as a rough equivalent of the Forth defining word CREATE. The syntax is:-

WORD, new-command-name, execution-address

This places the ASCII character string for the command name into the next free location in the dictionary, the string being terminated by a #D (carriage return). In turn, this is followed by the start address of the machine code to be executed (stored in low-byte, high-byte order, as per standard 6502 practice).

The start of the dictionary table is set in line 100 (using the Basic variable "B" as a pointer). The end of the table, effectively the next free location for new additions, is marked by a byte of #FF after the last valid execution address. See lines 130-180, which show the command WORD being set up as the first dictionary entry, and then used to form a small nucleus of additional expansion keywords.

In keeping with Atom Basic convention, keywords may be written in abbreviated form, followed by a period. When entering new command names using WORD, the initial upper case characters represent the shortest abbreviation; subsequent lower case characters being optional. Therefore VList, for example, can be written as VL., VLI., VLIS. or VLIST, all of which are perfectly valid. Naturally, the user must ensure that any abbreviation is long enough to distinguish the new command from any existing one.

Expansion nucleus

Though the essence of the program is to allow user defined extensions to Atom Basic, a small body of useful extra commands have been provided as a starting point. Some of these (WORD, VLIST and BASIC) are important 'housekeeping' commands to facilitate using the expansion program. The functions and syntax of the nucleus commands are as follows:-

WOrd — Allows new commands to be defined (see above).

VList — Lists all new commands in the expansion dictionary (like Forth VLIST).

BAsic — Sets the end of the table to the address after Basic itself.

All words defined after 'Basic' are, therefore, no longer valid, and only the nucleus commands remain. This is a useful command for the start of a 'defining' session, to clear down unwanted definitions from the dictionary, and ensure that maximum memory is available for the newer commands to be defined. Used at the start of a program, it also prevents any program based definitions from creating duplicated entries in the dictionary, each time the program is run. See the short demo program for an example.

PREss — Waits until a key has been pressed (returning the ASCII value in Accumulator). It is effectively the same

as LINK #FE94. This is a simple example of how existing operating system routines can be invoked by using meaningful command names instead of vague LINK commands. Furthermore, PRE. takes up less than half the bytes of LINK #FE94.

KEY [@-Z] — KEY is followed by a Basic integer variable (@-Z), into which it places a unique value (non-ASCII) for the key pressed. If no key is pressed, a value of 255 is returned. KEY does not respond to the Ctrl, Shift and Rept keys. To examine the values returned, try:-
DO KEY K; PRINT K; UNTIL 0

NOise A,B — Produces a tone where A controls the duration and B alters pitch. A random element is introduced into the sound by referencing the Atom's random number seed. The effect is one of a steady tone mixed with a measure of white noise. Try:-

FOR A=20TO100;FOR B=10TO200 STEP 5;NOISE A,B;NEXT;NEXT

SHape — The most complex of the nucleus commands. SHAPE allows a figure, or user defined character, to be drawn on the screen. It works in all available graphics modes, and will also draw in the appropriate colour, if the Atom colour encoder board is fitted. There are two forms to the command: SHAPE N,X,Y or SHAPE N

X and Y, if specified, give the coordinate to which the cursor is moved before drawing. N Points to the start address of data which defines the shape to be drawn. The first address holds the number of nibbles used in the definition of the character, which follow on immediately. The first two bits of each nibble determine how a point is to be plotted thus:-

00 — do nothing
01 — set Pixel
10 — invert Pixel
11 — blank Pixel

The last two bits of each nibble specify the direction to be moved before plotting the next point. After using CORRECT (see below), the values for each direction are as follows:-

00 — left
01 — right
10 — up
11 — down

As a brief example, let's imagine that we wish to define an L shape, three pixels high by two across. This would require four nibbles to define Pixels/movement, which could be written:

invert Pixel, move down = 10-11 = #B
invert Pixel, move down = 10-11 = #B
invert Pixel, move right = 10-01 = #9
invert Pixel, move right = 10-01 = #9

— giving two bytes, #BB and #99.

Assuming the data was to be stored from address #2805 onwards, the number of nibbles used in defining the figure is stored at this address, followed by the nibbles themselves:-

?#2805=4; ?#2806=#BB; ?#2807=#99
(this could also be written as !#2805 = #99BB04).

```
 10 PRINT$12"         ABDONSOF (C)"';GOTO 80
 20**********************
 30* A.V.WIJNGAARDEN    *
 40* MUSKETIERSVELD 201 *
 50* 7237GT APELDOORN   *
 60* THE NETHERLANDS    *
 70**********************
 80 DIM LL3,BB20,ZZ1,RR7,CC9,DD5,HH1,SS7,KK1,NN2
 90 F.B=0TO66:LLB=#3000:N.
100 B=#3800:?B=#FF
110 P.$21:GOS.a:GOS.a:P.$6
120 LINK ZZ0
130$B="WOrd":B=B+L.B+1
140 ?B=RR0%256:B?1=RR0/256:B?2=#FF
150 WORD,VList,DD0:WO.,SHAPe,SS0
160 WO.,PREss,#FE94:WO.,CORrect,KK0
170 WORD,KEY,KK1:WORD,NOise,NN0
180 WO.,BAsic,CC0
190 P.''"THE PROGRAM TAKES"'P-#3800" BYTES"
200 END
210aP=#3900
220[\\Set new BRKVEC, RDCHVEC\
230:ZZ0 LDA@(BB0/256):STA#203:LDA@(BB0%256):STA#202
240 LDA@(LL0/256):STA#20B:LDA@(LL0%256):STA#20A:RTS
250\\\New READCH routine - changes BRKVEC\\\
260:LL0
270 JSR#FE94:CMP@#D:BNELL1:TSX:LDA#106,X:CMP@#C2:BEQLL2:LDA@#D
280:LL1RTS
290:LL2
300 LDA@#D:STA#100,Y:LDX@0:STX#7:STX#1:STX#2:STX#5:INX:STX#6
310 LDA@(BB0%256):STA#202:LDA@(BB0/256):STA#203
320 JSR#FFED:JMP#C2EA
330\\\\\The expansion Program Proper\\\\\
340:BB0 LDY#5E:STY#3:JSRRR2
350:BB2 TYA:CLC:JSRHH1:JSRHH0
360:BB3 LDY@0:LDA(#52),Y:CMP@#FF:BEQBB12:CMP(#5),Y:BEQBB6
370:BB4 JSRCC5:BNEBB3
380:BB6 INY:LDA(#52),Y:CMP@13:BEQBB10:CMP(#5),Y:BEQBB6
390:BB13 EOR@#20:CMP(#5),Y:BEQBB6:AND@#20:BNEBB4:LDA(#5),Y
400 CMP@#2E:BNEBB4:STY#3:INC#3:LDA @13
410:BB14 INY:CMP(#52),Y:BNEBB14:BEQBB15
420:BB10 STY#3
430:BB15 INY:LDA(#52),Y:PHA:INY:LDA(#52),Y:STA#53
440 PLA:STA#52:JSR BB7:LDY#3:DEY
450:BB8
460 INY:LDA(#5),Y:CMP@32:BEQBB8:CMP@#D:BEQBB9:CMP@#3B:BNEBB12
470:BB9 LDX@#FF:TXS:JMP#C558
480:BB7 JMP(#52)
490:BB12
500 LDA#A000:CMP@120:BNEBB16:LDA#A001:CMP@169:BNEBB16:JMP#A1FF
510:BB16JMP#C9D8
520\\\\\\\\\ New command, 'WOrd' \\\\
530:RR0 JSRRR7:JSRHH0:LDA@#FF:LDY@0
540:RR4 CMP(#52),Y:BEQRR3:INY:BNERR4:INC#53:BNERR4:BEQRR5
550:RR3 TYA:CLC:JSRCC7:LDA#3:JSRHH1:LDY@0
560:RR1LDA(#5),Y
570 CMP@32:BEQRR6:CMP@44:BEQRR6:CMP@13:BEQRR5:CMP@59:BEQRR5
580 STA(#52),Y:INY:BNERR1
590:RR5JMP#C9D8
600:RR6 STY#3:STY#60:LDA@13:STA(#52),Y:INC#60:JSRRR7
610 LDA#52:PHA:LDA#53:PHA:JSR#C78B:DEX:STX#4
620 PLA:STA#53:PLA:STA#52:LDY#60:LDA#16,X:STA(#52),Y:INY
630 LDA#25,X:STA(#52),Y:INY:LDA@#FF:STA(#52),Y:RTS
640:RR7 JSRRR2:LDA(#5),Y:CMP@44:BNERR5:INC#3
650:RR2 LDY#3:LDA@32:DEY:INY:CMP(#5),Y:BEQRR2+5:STY#3:RTS
660\\\\\ New command, 'BAsic' \\\\
670:CC0 JSRHH0
680:CC1 LDY@0:LDACC8,Y:CMP(#52),Y:BEQCC2
690:CC3 JSRCC5:JMPCC1
700:CC2 INY:LDA(#52),Y:CMP@13:BEQCC4:CMPCC8,Y:BEQCC2:JMPCC3
710:CC4 JSRCC5:LDY@0:LDA@#FF:STA(#52),Y:RTS
720:CC5 LDA@13:CMP(#52),Y:BEQCC6:INY:BNECC5+2
730:CC6 TYA:CLC:ADC@3
740:CC7 ADC#52:STA#52:LDA#53:ADC@0:STA#53:RTS
750:CC8:]
760 $P="BAsic":P=P+L.P+1
770[:HH0 LDA@B/256:STA#53:LDA@B%256:STA#52:RTS
780:HH1 ADC#5:STA#5:LDA#6:ADC@0:STA#6:RTS
790\\\\\\\\\\New command, 'VList'\\\\
800:DD0 JSRHH0:JSR#FFED
810:DD1 LDY@0
820:DD2 LDA(#52),Y:CMP@#D:BEQDD4:CMP@#FF
830 BEQDD3:JSR#FFF4:INY:BNEDD2
840:DD4 JSR#FFED:JSRCC6:JMPDD1
850:DD3 RTS
```

This should help clarify lines 160 and 170 of the demo program, listing 2, where a 'pin-man' shape is defined. Also, by using the invert pixel option, the figure can be blanked out simply by re-issuing a SHAPE command with the same coordinates used in the previous call.

COrrect — The SHAPE routine accesses four locations, #2800 — #2803, to determine how its movement-determining nibbles are to be interpreted. Given a fixed set of data for a user defined character, it is possible to change these four locations so that the figure can be drawn the right way up, upside-down, rotated right or rotated left — that is, the defining data itself does not need to be altered in any way. The nibble values for movement right, up, left and down are stored in #2800-#2803 respectively. CORRECT stores 1, 2, 0 and 3 in these locations, so that a subsequent SHAPE command will draw a figure 'rightways-up'. To save you unnecessary calculation, the following values will provide the appropriate degree of rotation:-

!#2800 = #01030002 (rotated right — 90 degrees clockwise)

!#2800 = #02010300 (upside-down — 180 degrees clockwise)

!#2800 = #00020103 (rotated left — 270 degrees clockwise)

Apart from its obvious use in games, the rotation concept has more serious uses. For example, a user defined character set could be created and used to label charts and graphs both horizontally and vertically, using SHAPE. Note, incidentally, that since SHAPE and CORRECT use #2800—#2803, the floating-point variable, %@, should not be used simultaneously.

A short demonstration program is detailed in listing 2. Though simple, it serves as a concise example of all the expansion nucleus commands, plus a couple of newly defined ones. Firstly, 'BASIC' clears down any newer definitions, leaving only the nucleus commands. 'WORD' is then used to rename a ROM routine, and also defines a user-written routine, 'RIGHT', which ensures all shapes are drawn rotated right by 90 degrees. SHAPE is used to place a pin-man figure in the centre of the screen, having first called CORRECT to ensure he initially appears the right way up. If keys A, D, W or X are pressed (detected by KEY) the man moves left, right, up or down appropriately. Should our figure move too close to the screen border, the man reappears at the centre of the screen, having fallen down on his side (SHAPE called after the new RIGHT command). With lots of imagination(!), he can be heard letting out a semi-conscious groan (NOISE command). PRESS, heralded by BELL, then waits for any key to be depressed to repeat the process.

```
860\\\\\SHAPe ,N,X,Y \\\\\
870 SS0 JSR#C78B:JSRRR2:LDA(#5),Y
880 CMP@13:BEQSS7:CMP@59:BEQSS7
890 INC#3:JSR#C78B:JSRRR7:JSR#C78B
900 DEX:LDA#16,X:STA#5C:LDA#25,X:STA#5D
910 DEX:LDA#16,X:STA#5A:LDA#25,X:STA#5B
920 SS7 DEX:LDA#16,X:STA#52:LDA#25,X:STA#53
930 STX#4:LDY@0:LDA(#52),Y:BEQSS3:STA#54:INY:STY#57
940 SS1 LDY#57:LDA(#52),Y:STA#55:AND@#F:STA#56
950 LDA#55:LSRA:LSRA:LSRA:LSRA:STA#55
960 JSRSS2:LDA#56:STA#55:DEC#54:BEQSS3
970 JSRSS2:DEC#54:BEQSS3:INC#57:BNESS1
980 SS3 RTS
990 SS2 LDA#55:JSRSS4:LDA#55:AND@3:LDX@0
1000 CMP#2800,X:BEQSS5:CMP#2802,X:BEQSS6:INX:INX
1010 CMP#27FF,X:BEQSS5
1020 SS6 JMP#F668
1030 SS5 JMP#F671
1040 SS4 AND@#C:LSRA:LSRA:STA#5E:JMP(#3FE)
1050\\\\COrrect\\
1060 KK0 LDY@0:STY#2802:INY:STY#2800:INY:STY#2801
1070 INY:STY#2803:RTS
1080\\\\KEY  \\\\
1090 KK1 JSRRR2:JSR#FE71:TYA:PHA:LDY#3:LDA(#5),Y:SEC:SBC@64
1100 TAX:LDA@0:STA#33C,X:STA#357,X:STA#372,X:PLA:STA#321,X
1110 INC#3:RTS
1120\\\\NOise A,B \\\\
1130 NN0 JSR#C78B:JSRRR7:JSR#C78B:DEX:LDA#16,X:STA#60
1140 DEX:LDA#16,X:STA#5F:STX#4
1150 NN1 LDA8:AND@#F7:STA#B002:LDA9AND@#38:ADC@#48
1160 ASLA:ASLA:ROL10:ROL9:ROL8:LDX#60
1170 NN2 DEX:BNENN2:DEC#5F:BNENN1:RTS
1180]:RET.
```

Listing 1. Expansion program

Limitations and enhancements

As written, the machine code for the expansion program starts at #3900, with the dictionary occupying #3800 onwards. There is no explicit check to ensure that additions to the dictionary do not overwrite the machine code itself and suitable processing could be added (to WORD) to guard against this.

A further enhancement would be the addition of a Forth-like 'FORGET' command, to eliminate an individual entry. This would complement the blanket deletion performed by 'BASIC'. Incidentally, if two entries are made for the same command, the latest definition is ignored, unlike Forth, in which all earlier definitions cease to be active.

It is tempting to say that 'one is limited only by one's imagination'. Practically speaking, the limit is governed by the amount of free RAM available but within that constraint a great many avenues can be profitably explored. New structures for Basic (IF...THEN...ELSE, WHILE...WEND, procedures, with parameters, *à la* BBC), or assembler extensions (macros, assembler directives), are only some of the possibilities.

Whatever your preferences, the time spent on developing your own extensions will undoubtedly result in a more powerful computing tool. **END**

```
100 REM **********************************
110 REM SIMPLE DEMO FOR A.V.WIJNGAARDEN'S
120 REM ATOM BASIC EXPANSION.
130 REM   V. FOJUT, 31/07/83.
140 REM **********************************
150 REM SET UP NIBBLES TO DEFINE "MAN" SHAPE
160 N=#2805:?N=19: REM 19 NIBBLES REQ'D
170 N!1=#B98BBBBB: N!5=#88EEA9DA: N!9=#8088
180 BASIC: REM CLEAR DOWN DICTIONARY, LEAVING NUCLEUS
190 WORD,BEll,#FD1A: REM GIVE NAME TO "BEEP" ROUTINE
200 DIM P(-1):D=#2800:P.$21
210 [LDY@0:STYD+1:INY:STYD+3:INY:STYD:INY:STYD+2:RTS:]:P.$6
220 WO.,RIght,TOP: REM NEW WORD USES MACHINE CODE ABOVE
230 P.$12: CLEAR0: X=33: Y=26
240 CORRECT: REM ENSURE MAN FIRST DISPLAYED RIGHTWAYS-UP
250 SHAPE N,X,Y
260 DO
270  DO KEY K: U.K=33 OR K=36 OR K=55 OR K=56
280  SHA.N,X,Y:      REM BLANK OUT MAN AT OLD POSN.
290  IF K=33 X=X-1: REM A=LEFT
300  IF K=36 X=X+1: REM D=RIGHT
310  IF K=55 Y=Y+1: REM W=UP
320  IF K=56 Y=Y-1: REM X=DOWN
330  SHAPE N,X,Y:    REM REDRAW MAN AT NEW POSN.
340 U.X<2 OR X>61 OR Y<7 OR Y>47
350 SHAPE N,X,Y:      REM BLANK OUT MAN
360 RIGHT:  REM ALL SHAPES NOW ROTATED BY 90 DEGS.
370 MOVE33,26:SHA.N: REM MAN 'FALLS' ON SIDE
380 A=5:F.B=50TO150:NOISE A,B:N.: REM SEMI-CONSCIOUS GROAN
390 P."PRESS ANY KEY TO CONTINUE"'"(ESCAPE TO END)"
400 BELL: PRESS: RUN
```

Listing 2. Demonstration program

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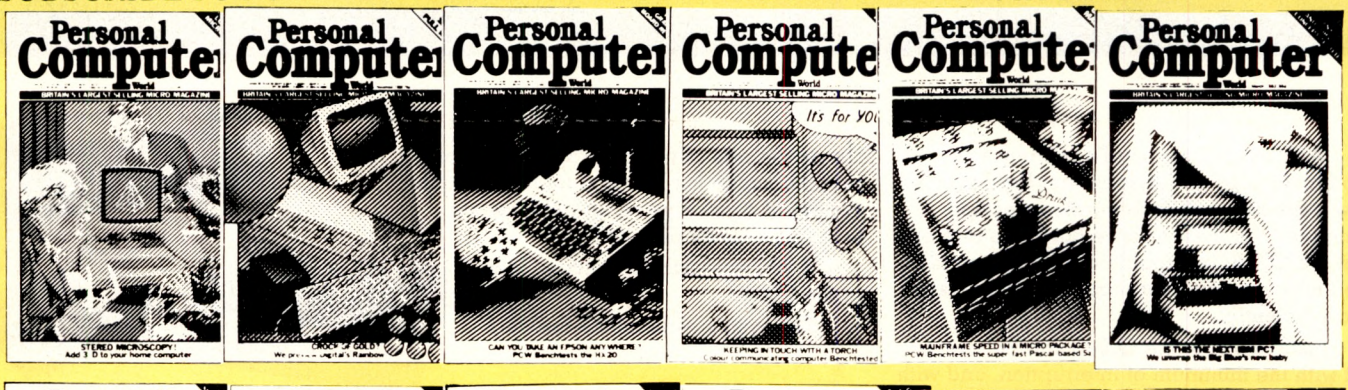
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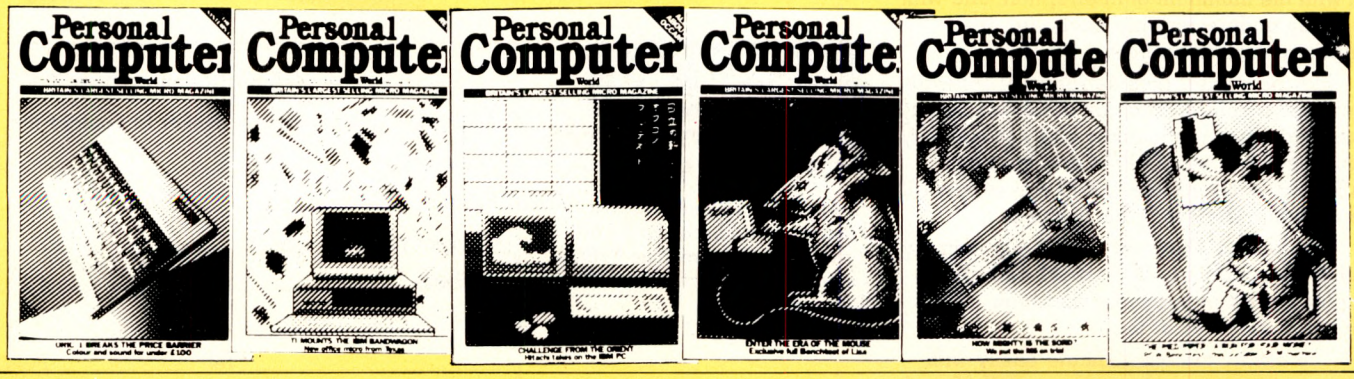
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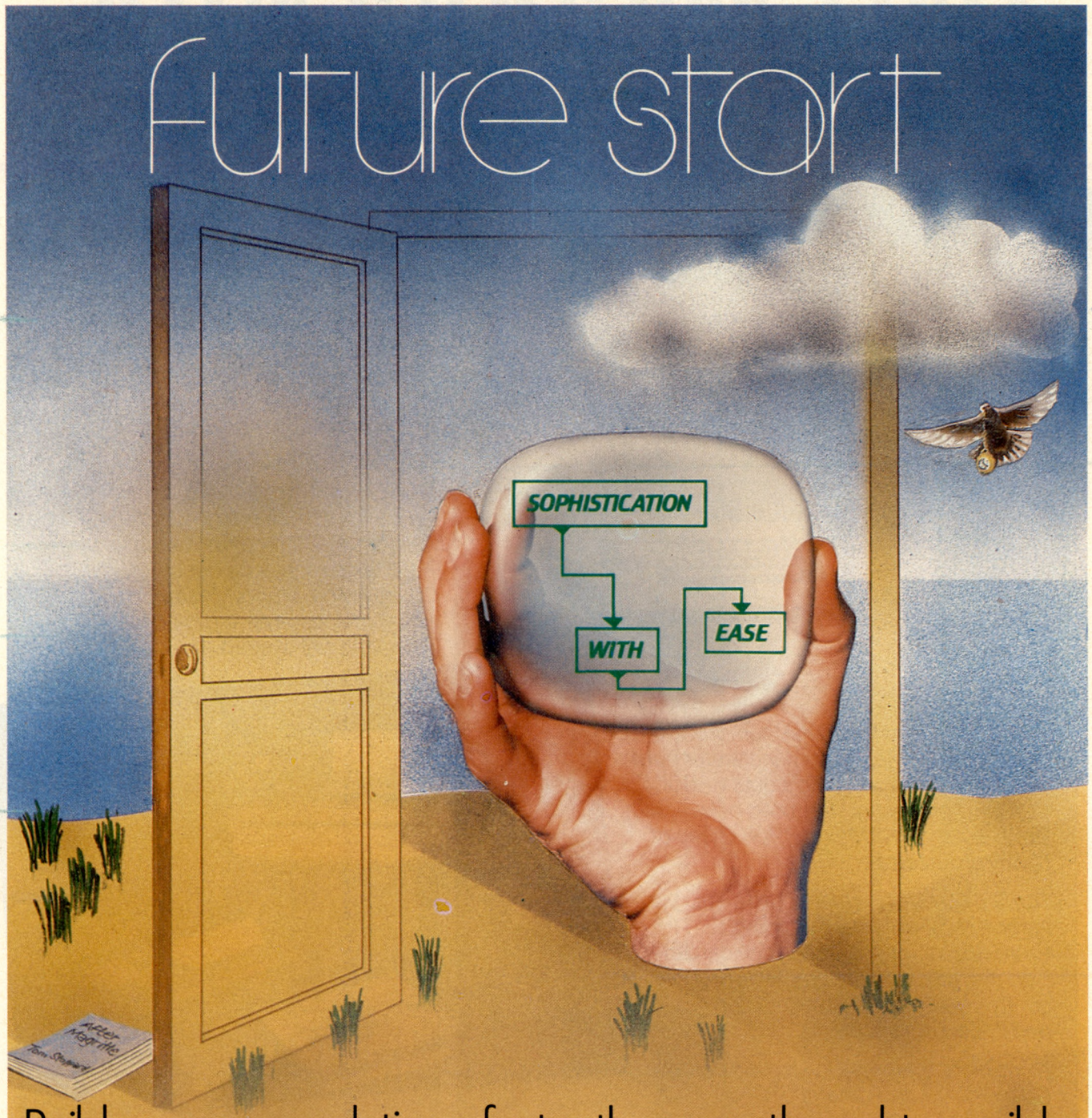
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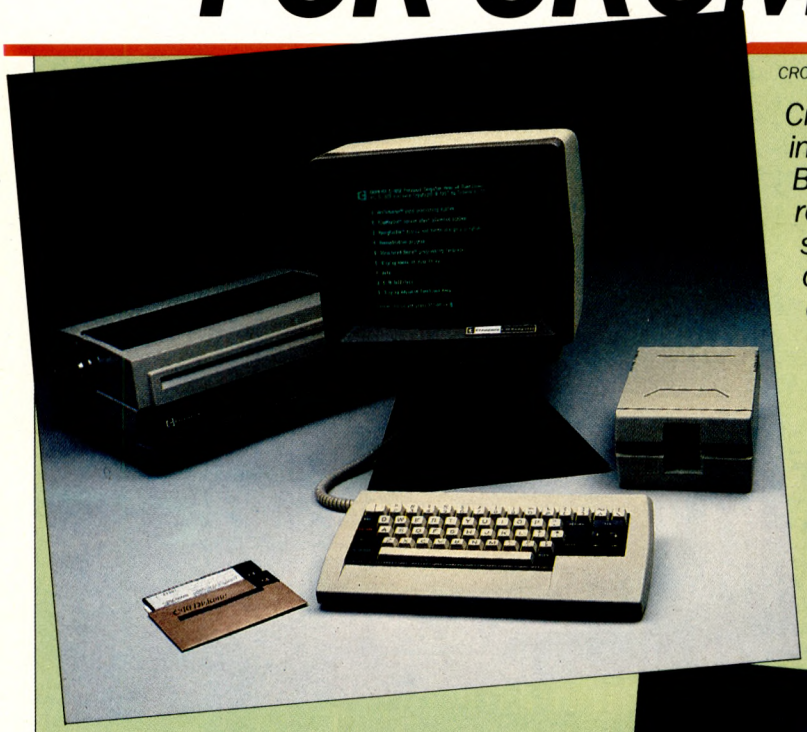
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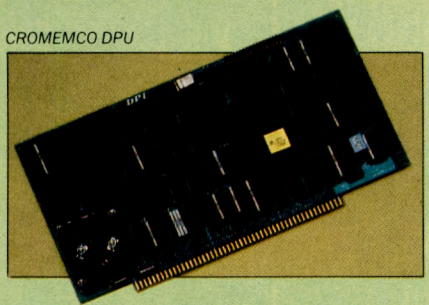
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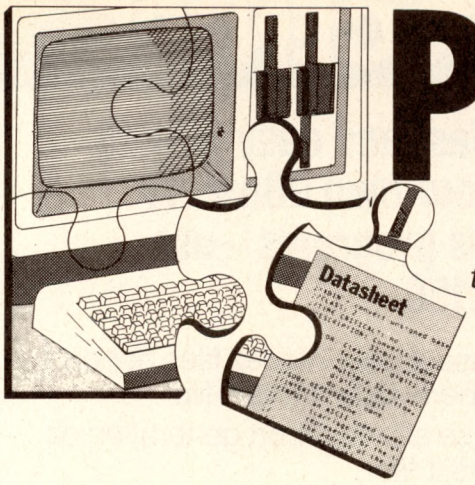
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Z80 BLOCK RELOCATION

Several of you liked R G Cath's 6502 block relocation routine RRL (*PCW* September '83) well enough to implement it for other processors. First, a couple of errors. LDA M9 should be inserted at the 17th. instruction. The 41st. instruction should have been BBC RRL3. We apologise to the BBC.

For the Z80, we like this effort from Mark Wenham of Inistioge, Eire. His ROLR moves a block to either a lower or higher memory address, using the Z80 block move instructions. One of its best features is its simple, unambiguous input requirements; the address of the first byte to be moved, the address of the last byte to be moved and the address to which the block is to be moved. Where the block is moved to a higher memory address, memory below the destination is moved down to make way for it and where the block is moved to a lower memory address, memory above the destination is moved up.

DATASHEET

```
;= ROLR—Block relocation.
;/CLASS: 2   (Could be made CLASS 1 by preserving the A
              register and flags, since they are not needed to
              convey information to or from the routine.)
;/ TIME CRITICAL ?: No
;/ DESCRIPTION: Rotates a block of memory up or down
                 memory.
;/ ACTION: Not given
;/ SUBr DEPENDENCE: None
;/ INTERFACES: None
;/ INPUT:  BC = address of first byte of block to be moved
;/         HL = address of last byte of block to be moved
;/         DE = address block to be moved to. (HL = BC
              is OK)
;/ OUTPUT:  The block is rotated.
;/ REGs USED:  AF, BC, DE, HL
;/ STACK USE:  6
;/ LENGTH:  68
;/ PROCESSOR:  Z80
ROLR: AND A       ;clear carry                    A7
      SBC HL,DE   ;compare last address of        ED 52
      ADD HL,DE   ;block with destn. address      19
      JR C,UP     ;if destination higher, jump    38 0E
DOWN: PUSH HL     ;else save end of block         E5
      SBC HL,BC   ;get length of block            ED 42
      PUSH HL     ;and save it                    E5
      ADD HL,BC   ;                               09
      SBC HL,DE   ;get total bytes between        ED 52
      EX (SP),HL  ;end of block & destination     E3
      POP BC      ;into BC                        C1
      POP DE      ;DE = address of end of blk     D1
      INC HL      ;HL = length of blk to be       23
      SCF         ;moved. Set 'down' flag         37
      JR MOVE     ;                               18 11
UP:   AND A       ;clear carry                    A7
      INC HL      ;                               23
      SBC HL,BC   ;get length of block            ED 42
      PUSH HL     ;save it                        E5
      EX DE,HL    ;destination = destination +    EB
      ADD HL,DE   ;length of blk to be moved      19
      EX DE,HL    ;                               EB
      ADD HL,BC   ;HL = end of block              09
      EX DE,HL    ;HL = destination               EB
      SBC HL,BC   ;get total no. of bytes         ED 42
      LD D,B      ;between destn. & blk start     50
      LD E,C      ;DE = start of block            59
      EX (SP),HL  ;HL = length of block           E3
      POP BC      ;BC = total bytes +1            C1
      DEC BC      ;                               0B
MOVE: DEC HL      ;decrement counter              2B
      PUSH HL     ;save counter                   E5
      PUSH DE     ;save start or end of block     D5
      PUSH BC     ;save no. of bytes to be        C5
      LD H,D      ;moved                          62
      LD L,E      ;                               6B
      LD A,(DE)   ;get byte                       1A
      JR C,LWR    ;jump if 'down' flag set        38 05
      INC HL      ;else move rest of block &      23
      LDIR        ;bytes between block and        ED B0
      JR INS      ;destination down               18 03
LWR:  DEC HL      ;or move rest of blk & bytes    2B
      LDDR        ;from blk & destination up      ED B8
INS:  LD (DE),A   ;insert byte                    12
      POP BC      ;                               C1
      POP DE      ;                               D1
      POP HL      ;                               E1
      PUSH AF     ;save flags                     F5
      LD A,H      ;test counter                   7C
      OR L        ;                               B5
      JR Z,END    ;                               28 03
      POP AF      ;restore flags                  F1
      JR MOVE     ;and continue                   18 E3
END:  POP AF      ;restore stack                  F1
      RET         ;and return                     C9
```

COMMON AREAS AND MACRO-80

Dr Michael Wilson, of University College, London, has had a chance to test out the new release (3.45) of the LINK-80 loader on their RML 380Z and finds that the bug with COMMON, mentioned in December's Sub Set, persists.

Ian Cull, of Catford, experienced similar problems with COMMON areas in Macro-80. His eventual cure was to pass all .REL files through LIB-80 as in:—
A LIB-80 file = file.

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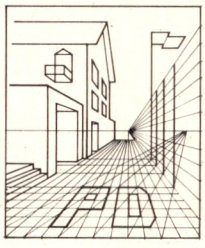
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MORE MOVING DATA

Like the first, the following two Datasheets this month deal with the problems of moving blocks of data — or programs — around in memory. BLKMV from Martin Ford of Redruth is an intelligent block transfer routine for the 6502 to ensure that the transferred data will not overwrite the source data. BLKEXG is a 6809 version of RRL from Martin Chadwick of Oxford. Martin wonders how many other 6809 users, outraged by the length of RRL, have written. None yet.

DATASHEET

```
;= BLKMV — Intelligent data block move.
;/ CLASS: 2  (page zero altered)
;/ TIME CRITICAL?: No
;/ DESCRIPTION: Overwrite-proof data block transfer
;/ ACTION: If destination = source then end Else if
;         destination > source then transfer from last byte
;         downwards Else transfer from first byte upwards
;/ SUBr DEPENDENCE: None
;/ INTERFACES: Source and destination RAM.
;/ INPUT: M0,1 = address of 1st byte of source block
          M2,3 = address of 1st byte of destination
          M4,5 = byte length of source block
;/ OUTPUT: Block transferred. M0 — M5 corrupted
;/ REGs USED: M0 — M5
;/ STACK USE: 4
;/ LENGTH: 112
;/ PROCESSOR: 6502

BLKMV PHP       ;save registers                  08
      PHA       ;                                48
      TXA       ;                                8A
      PHA       ;                                48
      TYA       ;                                98
      PHA       ;                                48
      LDY #0    ;zero index initially            A0 00
      CLD       ;ensure binary arithmetic        D8
      LDX M4    ;byte count lo-byte into X       A6 ZZ
      SEC       ;test relative positions of source 38
      LDA M0    ;and destination, saving result  A5 ZZ
      SBC M2    ;lo-byte for equality check      E5 ZZ
      STA M4    ;if no carry from result, then   85 ZZ
      LDA M1    ;destination higher than source  A5 ZZ
      SBC M3    ;and transfer to be from end byte E5 ZZ
      BCC BKWD  ;downwards                       90 1D
      ORA M4    ;if dest. = source then no move  05 ZZ
      BEQ BRET  ;necessary so exit               F0 4D
      INC M5    ;dest. < source so move from lowest E6 ZZ
      TXA       ;byte upwards. Hi-byte count is  8A
                dec'd
      BEQ TST2  ;separately, so INC it first     F0 0E
LP1:  LDA (M0),Y ;if lo-byte count in X not zero then B1 ZZ
      STA (M2),Y ;move data byte and index next  91 ZZ
      INY       ;skipping to count decrement if  C8
                index
      BNE TST1  ;not zero. Else 256 bytes moved so D0 04
      INC M1    ;inc source and dest. base pointers E6 ZZ
      INC M3    ;to next 256-byte block          E6 ZZ
TST1: DEX       ;loop for no. of bytes in count  CA
      BNE LP1   ;lo-byte                         D0 F2
TST2: DEC M5    ;loop for no. of 256-bytes in    C6 ZZ
      BNE LP1   ;count hi-byte                   D0 EE
      BEQ BRET  ;finished                        F0 34
BKWD: TXA       ;starting at last byte so change 8A
      ADC M0    ;source and dest. base pointers to 65 ZZ
      STA M0    ;address last byte — 255 by adding 85 ZZ
      LDA M5    ;data block byte length and      A5 ZZ
      ADC M1    ;subtracting 256. Then dec Y so  65 ZZ
      STA M1    ;Y = 255 initially and indexes   85 ZZ
      TXA       ;end byte                        8A
      CLC       ;                                18
      ADC M2    ;                                65 ZZ
      STA M2    ;                                85 ZZ
      LDA M5    ;                                A5 ZZ
      ADC M3    ;                                65 ZZ
      STA M3    ;                                85 ZZ
      DEC M1    ;                                C6 ZZ
      DEC M3    ;                                C6 ZZ
      DEY       ;                                88
      INC M5    ;inc count hi-byte for extra dec later E6 ZZ
      TXA       ;initial test of count lo-byte   8A
      BEQ TST4  ;if zero go dec count hi-byte    F0 0F
LP2:  LDA (M0),Y ;move data byte and index next  B1 ZZ
      STA (M2),Y ;skipping to count decrement if 91 ZZ
      TYA       ;dec'd index not gone below zero 98
      BNE TST3  ;else 256 bytes moved s decrement D0 04
      DEC M1    ;hi-bytes of base pointers to give C6 ZZ
      DEC M3    ;addresses of next 256-byte block C6 ZZ
TST3: DEY       ;                                88
      DEX       ;loop for no. of bytes in count  CA
      BNE LP2   ;lo-byte.                        D0 F1
TST4: DEC M5    ;loop for no. of 256-bytes in    C6 ZZ
      BNE LP2   ;count hi-byte                   D0 ED
BRET: PLA       ;restore registers               68
      TAY       ;                                A8
      PLA       ;                                68
      TAX       ;                                AA
      PLA       ;                                68
      PLP       ;                                28
      RTS       ;and return                      60
```

DATASHEET

```
;= BLKEXG — Data block exchange (= Rotate Right Long)
;/ CLASS: 1
;/ TIME CRITICAL?: No
;/ DESCRIPTION: Exchanges positions in RAM of two
                contiguous blocks of data.
;/ ACTION: Exit immediately if 2nd block at lower address
           than 1st block.
           For each byte in 2nd block
             Pick up byte
             Move 1st block up by one byte
             Put byte below 1st block
;/ SUBr DEPENDENCE: None
;/ INTERFACES: 1st & 2nd blocks in contiguous RAM
;/ INPUT: X = address of 1st byte of 1st block
;/        D = address of 1st byte of 2nd block
;/        Y = address of byte following 2nd block
;/ OUTPUT: Carry set: input error — no action
;/         Carry reset: order of 1st & 2nd blocks exchanged
;/                      D = new 1st block, X = new 2nd
                        block
;/ REGs USED: D X Y CC
;/ STACK USE: 10
;/ LENGTH: 34
;/ PROCESSOR: 6809

BLKEXG: PSHS D,X,Y ;save registers                34 36
        SUBD 2,S   ;calculate length of 1st block A3 62
        BCC MV3    ;and go okay if 1st block lower 24 10
        PULS D,X,Y,PC ;else exit, Cy set, error.  35 B6
MV1:  LDB ,X       ;pick up next 2nd block byte   E6 84
MV2:  LDA ,-X      ;shift 1st block up by one byte A6 82
      STA 1,X      ;work down with endtest        A7 01
      CMPX 2,S     ;on stacked ad. of 1st block   AC 62
      BNE MV2      ;start byte. Then put 2nd block 26 F8
      STB ,X+      ;byte, inc 1st block start     E7 80
      PULS D,Y     ;addr. Rest. length, discard old 35 26
MV3:  PSHS D,X     ;start ad.) Save length and 1st 34 16
      LEAX D,X     ;block address. Get next ad.   30 8B
      CMPX 8,S     ;2nd block byte and loop       AC68
      BNE MV1      ;if not at end of 2nd block    26 EA
      PULS D,X,Y   ;else end, Cy reset, tidying up 35 36
      PULS D,Y,PC  ;stack and rest. values.       35 A6
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Soft Sell

When five educated gentlemen spurn the attractions of law and architecture to open a computer software shop, will society be shocked and bemused, or impressed? Jerry Sanders peers behind the counter at Pilot Software City.



When Napoleon Bonaparte called the English a nation of shopkeepers his purpose was to scorn the enemy. He used an image calculated to wound the aristocracy, and thus the Officer class of the British Army. Money was 'all right' if you didn't have to work to earn it. The tradesman's entrance, which can still be found in many older houses, is a reminder of the distaste felt by yesterday's elite for the shop-owning class.

Even in today's enlightened society many people think it's not quite the proper thing to open a shop — unless, that is, it's an art or antique gallery. Alternatively, one is allowed to be a Lord or Lady and open one's stately home to the public — so long as one hangs 'private' notices across 10 per cent of the staircases. So, when a university professor, a lawyer, three architects and a computer programmer open a shop to sell computer games, something novel may be happening in our society. The significance of this change is increased by the presence of the computer element as the catalyst which brought it about.

The shop, Pilot Software City, is in Rathbone Place, near London's Tottenham Court Road. This puts it at the centre of an area more populated with micro chips than anywhere else in Britain. The shop's name gives away the identity of another catalytic element — the USA. Hamburger Cities, Motor Cities, even Footware Cities abound there. 18 months ago, Kelvin and Malcolm 'Fred' Robinson went to Los Angeles to look at software retailing American style. They liked what they saw and this, combined with what Kelvin calls the American work ethic, provided the basis for their new shop.

Kelvin defines the American work ethic as identifying what is actually possible, and then going for it. This is not how shops are usually run in Britain: here, it's a question of identifying profit and chasing it. Profit chasing is not an obvious motivating force behind Pilot Software City, and perhaps for this reason it promises to be a success.

The launch of the shop was preceded by discussions over a long period between Kelvin and Professor Sandy Douglas of the London School of Economics. Professor Douglas is company chairman of Pilot and his son Malcolm is technical director. Kelvin's ideas found a sympathetic ear in Sandy, who, as a professional educator and computer consultant, was well placed to predict market trends. Five years ago he lectured on the importance of packaging for mainframe computer programs. 'I think that in general, people in the mainframe industry were slow in seeing the micro boom coming. I'd been talking to them, telling them they had to take packaging seriously. On the hardware front, after we had studied the American market and considered what was possible, we saw one big difference. In Britain, as is still the case, much of the hardware on the market was being sold on what is essentially a drop dead basis. That is, you buy a machine and find out at some stage that it doesn't work, so you go back to the shop and they say 'drop dead!' That certainly doesn't work with software.'

Communications

This is a point a fifth member of the team, Ian Dalton, can confirm. Ian is marketing manager at Pilot, and first got involved after agreeing to help a schoolfriend (Fred) man Pilot's stand at an Earls Court exhibition. Ian qualified as a lawyer at Cambridge and took his first job as a trainee sales manager with Unilever. When Fred introduced him to Kelvin and the Robinson parents, the die was cast. 'I was aware' said Ian, 'that there were many salesmen who knew a lot about computers but couldn't communicate. The entire concept of Pilot is founded on simple strength — we can communicate with people. In particular, customers often need help in expressing their problems, let alone having them solved.'

Kelvin and Ian agreed this would be a real contribution to the success of the project, and Ian was signed up.

Kelvin and Fred's father is Dale Robinson, head of the School of Planning at the Chelmer Institute, Chelmsford. Both Dale and his wife June are members of the Pilot team. Dale has spent most of his time working with senior managers in industry. Because of that, in Kelvin's words, 'he has to talk sensibly to them about their problems. When you're designing a factory for someone, you need to understand the product as well as your own input.' Dale's input has been in the layout of the shop in partnership with June, whose experience in interior design has proved to be an asset.

I asked Kelvin if Pilot, with such experience at its disposal, was going to use it. He confirmed that Pilot would be expanding its consultancy work into the field of computer environments.

Sandy started computing as a theoretical physicist at Cambridge, where he came across EDSAC (Electronic Delay Storage Automatic Calculator). His

Photograph and hand tinting by Michael Bennett



l. to r. ***Kelvin Robinson, Malcolm Douglas, Tom Stephenson, Prof. Sandy Douglas, Bill Stott, Dale Robinson, Malcolm Robinson, Ian Dalton.***

work on atomic wave functions and X-ray crystalography involved a lot of calculations so he thought EDSAC would make his life easier.

'I'm not sure that it did' said Sandy, 'but it certainly changed it! It wasn't a very powerful machine: any of the micros we have in the shop here could be regarded as up to 1000 times more powerful. It was made out of used valves from Air Force radar sets by my colleagues at the maths lab in Cambridge. I was the first person to be a real user because I had a problem to do on the machine, whereas most of the others had to invent problems to run!'

For the last 14 years Sandy's been a professor at the LSE, teaching computing in a social science environment, but without losing links with industry. He's been involved in consulting for governments and industry throughout, with a particular interest in that thorny subject, the introduction of computing to the printing industry. He's involved in many international activities and is a governor of the International Conference of Computers in Communication.

I call that an impressive background for the chairman of a shop selling micro

software. When you remember that Sandy's son Malcolm, himself a software expert, is on the team as well you may begin to ask if there isn't more to it than a software shop. What is it that made these successful younger generation individuals turn away from promising careers in architecture, computing and law? I put this question to Malcolm Douglas.

'When I went into the computer industry it was as a software specialist, and I found that most of the projects I was involved in cast me as a backroom boy, a technician. On rare occasions I actually met the client, but most of the time I was given a brief to go away and write a piece of software without any personal contact with the customer. This began to irritate me, especially when I began to see that what I wrote didn't always relate to what was *really* wanted. I was unhappy with this, so I changed jobs and did some work for my father. Now I was directly involved with the client and could discuss with him exactly what was required, often helping him to specify his needs more exactly.'

Malcolm then found himself out in Australia acting as the human interface between a group of geological physicists and their computer. 'Their's was a typical horror story: some impressive computer equipment coupled with messy programs they'd knocked up themselves, extremely unfriendly ones at that. New people joined the group and this demanded time and trouble while they learned how to use each of these very unfriendly packages. I took them and made them more friendly: it was a lot of fun, but once the job was done there was no more interest in it for me.'

Malcolm returned to England and did some more work for Dad. It was at this time that Kelvin and Sandy were discussing the Pilot project, and it sounded like a good idea to Malcolm. In particular, he had noticed that because of a trend towards general purpose packages which users could tailor to their own needs, the demand for bespoke software was beginning to decrease.

'My feeling as a technician was that although these packages are a wonderful idea, they aren't always very friendly. Some kind of shop-with-consultancy would be an ideal way of making sure the first time user got the help he needed.'

So Malcolm signed up with Pilot. To complete the team is Fred Robinson, the proverbial 'black sheep'. Whereas the rest of the lads successfully completed approved schemes of education, Fred was a drop-out. Of the younger generation at Pilot he is the most experienced self-searcher. 'I've done varied and eccentric things from architecture (half a course at Oxford Poly), catering, farming . . . some experience in micros.' Fred was too modest to expand on the talent for which he is most valued by his colleagues, but step-father Dale stepped in to complete the picture.

'Fred is the epitome of the user friendly *person*. He's a people specialist, a valuable member of the team from Kelvin's point of view.'

Dale didn't expand, but I think I know what he meant. Kelvin is thrusting and charming but can be a little abrasive: Fred is just the kind of person to mend any fences Kelvin may break.

Setting up

The original idea for financing the shop was to take advantage of the government's small business scheme, but it proved too cumbersome and the families decided instead to go for a straightforward loan from Barclays Bank, on a pound for pound basis. With all the architectural experience available, identifying the right kind of property was no problem. It was less easy to actually rent one: half a dozen abortive exercises eventually led to success with the Rathbone Place site, out of the neon-glitter mainstream of Tottenham Court Road — a good image for a different kind of venture. How different can be judged, according to Kelvin, by the fact that in their shop 'the customers talk to each other'.

'The people at Pilot agree that the transition from role playing games to role playing learning on computers is just around the corner. They want to be involved both as suppliers and originators . . .'

Is the Pilot team going to be happy acting as middle-men for software houses? I didn't think so, and asked Kelvin what 'own-brand' products Pilot is going to market. The answer was unexpected: 'thinking games'. 'Zap-pow games are fun, said Kelvin, but the main power of the micro lies in its ability to interest, amaze and *educate*.' A long-term project is in hand to provide a new kind of educational software which, instead of teaching users how to do a specific task, may be more broadly educational.

Kelvin mentioned that the team is interested in educational theory — and Sandy as a Professor has wide experience as an educator. I put it to them that it was more difficult for a learner to make the constructive bond to a VDU than the bond a student makes to a teacher. Sandy disagreed.

'A computer is already an effective teaching instrument for many kids. Those of us who passed through the educational system years ago were only concerned with the teacher and the blackboard. People who have been playing around with terminals since the age of five or six won't have the same worries we might have. With regard to identification with teachers, perhaps micros will take the hit and miss aspect out of teaching altogether.'

What about computer-generated violence, I asked? Micros are renowned for generating frustration. Ian agreed that trying to make a program behave can be upsetting. 'In the States the problem is adequately dealt with' he said. 'They have rubber baseball bats which don't do any real damage, but you can beat hell out of your computer with them. If it weren't for the fact that they don't pass British fire regulations, we'd be stocking them here. Another possibility is that we might convert one of the classrooms in Pilot's basement into a Japanese-style frustration room, where there are life-size models of your bosses to bash over the head'. Most appropriate, since so many micros have Japanese technology inside them!

But what will Pilot's own products be? 'Matrix mathematicians and weird, wonderful and crazy people' is the recipe for the future. Pilot's first own-brand product is to be a multiple role playing game, described by the team as 'a logical fantasy world in which evolution and genealogy are mapped as the game progresses, and are available at all times to aid the player in solving problems associated with the game.'

Involvement

In 'Photofit' (*PCW*, August '83), John Higgins noted that programs prepared for training use in foreign countries can be used in languge teaching, where the role playing environment stimulates use of the new language. The people at Pilot agree that the transition from role playing games to role playing learning on computers is just around the corner. They want to be involved both as suppliers and originators, and had hoped to announce their first product before Christmas. The pressures of stocking up on other manufacturers wares prevented this, illustrating one of the dangers Pilot will face in making the transition from middle-man to originator.

In the meantime, Pilot Software City offers one of the most educating software outlets in the country. During our interviews, no-one at Pilot mentioned plans to open other branches. There are enough architects, lawyers, computer programmers and graduates of all kinds on the unemployment registers for many more Pilot-type shops to be opened up and down the country, and in the process, make Napoleon turn in his grave!

END

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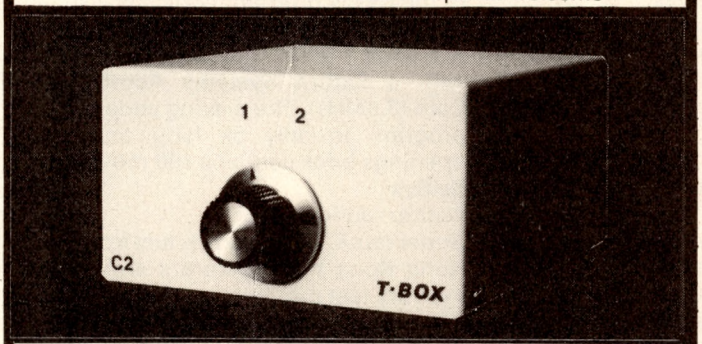
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MICROCHESS

Move from the East

This month, Frederic Friedel, editor of the West German Computer Shack *magazine, reports on the Budapest World Microcomputer Chess Championships held in October 1983.*

Nobody believed it could be done. A dedicated computer chess enthusiast in Hungary, Dr Laszlo Lindner, worked unerringly for almost a year. In the end all the large manufacturers of chess computers—and a few amateur entries—got together in Budapest to take part in the Third World Microcomputer Chess Championship — the first time an event of this kind has been staged in a socialist country.

There were astonishingly few problems getting the computers to Hungary. A number of units, especially the 68000-based ones, had to be cleared by the US Trade Administration before being allowed to go on the trip. And the Hungarian customs officials had to be carefully prepared to cope with the sudden arrival of so many computer systems at Budapest Airport. But everything went well and on the evening before the tournament all participants had arrived safely at the Szamok Computer Education and Information Centre, the venue of the World Championship. The teams and the participating machines were as follows:

Fidelity Electronics:
Authors: Dan and Kathe Spracklen, Ronald Nelson, Boris Baczynskyj.
Prestige. This is the chess computer well known to afficionados as one of the finest (and most expensive) sets available on the market. The version used in Budapest ran at 4MHz on a 6502C. The new program (in EPROM) is 20k long and requires 14k RAM. The machine is capable of generating and evaluating about 1000 positions per second. The special openings library contains 16,000 positions.
Elite A/S. A completely new product (no connection with the old Elite) manufactured at Fidelity's plant in Germany. The handsome wooden board is less bulky than the Prestige. Both programs are identical, although the Elite A/S processor runs at 3MHz and looks at 750 positions per second. Normally the unit comes with a built-in openings book containing about 16,000 positions, but as in the Prestige the Spracklens used a specialised tournament book with fewer (but deeper) lines in Hungary.
Chess Challenger Sensory 9. The newest version of the well-known 'CC 9' has become faster (2MHz instead of 1.5, 500-600 nodes per second) and received an improved program which resides in 16k masked ROMs and contains some very interesting new algorithms. The openings book contains 3000 positions.

Hegener & Glaser:
Authors: Thomas Nitsche, Elmar Henne
Mephisto Excalibur. The big wooden Mephisto sensor board has no less than a complete 68000 system built into it. The 43 kbytes program is loaded from EPROM into RAM, allowing the system to run at 8MHz (on the 1802 used in the regular Mephisto unit this would correspond to about 21MHz!). The new Mephisto III program has an extremely selective search and looks at only five positions per second, spending most of its time on sophisticated chess evaluations. The openings book contains about 1500 moves and the program will recognise all transpositions. The unit is available in Germany for around £1250.
Mephisto X. Practically identical to the Excalibur, except for a smaller openings book of 1000 moves.
Mephisto Y. Also identical with the other two. For experimental purposes this unit first played without an openings library, later the book from the 'X' was used.

Novag Industries:
Authors: David Kittinger, Scott McDonald.
Constellation. The normal Constellation speeded up from two to three MHz, but otherwise unchanged (6502, 16k ROM, 2k RAM, 2500 positions in book). The computer looks at about 800 nodes per second. Although it has no special end game heuristics, it uses this speed to go down 10-11 ply and play very pretty end games. Constellation is also well-known for tactical brilliancies.
Super Constellation. A new version planned for 1984. In Budapest the prototype ran at 4MHz (6502C) but had to be slowed down to 3.6MHz after technical difficulties in the first two games. The program is 32k long and requires 4k of RAM. It looks at just over 1000 positions per second.
Novag X. A true Kittinger 'Experimental' which he expected would win the tournament outright. The 34k program running on a 6502C at 3.6MHz was built into the base of Novag's 'Robot' with LEDs around the edge of the board to indicate the computer's moves.

Intelligent Software:
Authors: Richard Lang, Mark Taylor
Chess 2001: This computer, programmed in England and manufactured in Hong Kong, performed very well in the *PCW* tournament in London. It is one of the few Z80-based chess computers left. The processor was running at 8MHz in Budapest (vs. 4 in the standard version). The 16k program is in masked ROM and includes an openings library of 2500 positions. It conducts a selective search and looks at about 500 nodes per second.
Chess 2001 X. Identical with the previous unit (except for red squares on the chess board). For experimental purposes David Levy, who was operating the machine, turned off the openings library for a large part of the tournament.
65 Cyrus X. A completely new version of the Cyrus program (which is also in the 2001), developed by Richard Lang and Mark Taylor. They used an Apple II with a Saturn Systems Accelerator Card (3.6MHz). The playing code of the program is only 5k long and the openings book contains 180 moves.

SciSys:
Author: Julio Kaplan
Superstar X. This new product from the Hong Kong manufacturers arrived at the very last moment via Holland. The 24k program is executed by a 6502A running at 2MHz and looking at about 400 nodes per second. The openings library contains 2500 positions. This computer has some highly interesting I/O features and 24 extremely versatile playing levels.

Mikroelektronik Erfurt:
Authors: Rüdiger Worbs, Dieter Schultze
Chess Master. The very first East European chess computer, developed and built in the German Democratic Republic. It has advanced magnet sensors and LEDs in all 64 squares. The processor (U 880 D, 2.5MHz), a development of the company, is very close to

Zilog's Z80. The program is 12k long, contains 180 opening moves and looks at 12-15 positions per second. The wooden board unit has a novel method of entering positions. It is already available in East Germany and will probably be sold in western countries at very competitive prices.

University of Hamburg:

Authors: Manfred Allers, Dirk Hauschildt, Alexander Reinefeld, Jan Ropers, Dieter Steinwender

Micromurks. This 68000-based program is already available on disk in the USA. In Budapest it ran on a new 68000 card (the 'AP-20' built by IBS in West Germany) with an effective speed of 3.5MHz. The playing code requires 32k RAM in the Apple and the highly specialised openings book contains 824 positions.

University of Copenhagen:

Authors: Kaare Danielsen, Hartvig Ekner

Logichess 2.2. The authors were the youngest in the tournament (21 and 19). They brought a Lynx (Z80A, 4MHz) to Budapest and their program, which is stored on cassette, used a total of 24k RAM. It conducts a selective search and looks at about 50 positions per second.

Private entries:

Labirint 64. This compact unit with alphanumeric move entry and a microscopic display was built by a Romanian team. It is 8085-based and looks at no more than one position per second. It entertains its opponents by playing melodies to express its feelings — a triumphant tune when capturing a piece, sombre strains when it is losing.

Gedeon X. The only Hungarian participant, Bela Gedeon, turned up with a modified Chess Challenger Champion from Fidelity (as far as I could ascertain the modification was only to the power supply!). Data of the machine: 6502B, 3MHz, 32k ROM, 16k RAM.

The tournament began with loud protests when it turned out that Fidelity was prepared to certify that the Sensory 9 entry was 'identical to the units that are available under the same name'. This meant that the Sensory 9 would be the only set qualifying for a special prize for the best commercial unit. General Manager Sid Semole swore that the increase in speed and the new program were part of the current production run and so Sensory 9 was given the commercial prize before the tournament began. Later on, the East Germans also laid claim to the prize, but Fidelity's machine had a point more in the end and retained the award.

Micro computer chess tournaments are fraught with commercial interests and there is bound to be a lot of politicking during the games. The computers are always very calm, the programmers usually anxious and the manufacturers often extremely aggressive. During the fifth round in Budapest there was an incident that illustrated the basic atmosphere.

In this round Fidelity's finest, the Prestige, which was tied for second, had to play one of the Mephisto machines. These were not doing too well and badly needed every point they could get. Ossi Weiner, PR consultant and best chess player in the Mephisto team (he has won the Munich championship twice) was operating the German machine; Dan Spracklen made the moves for Prestige.

Round 5 (17.9.1983)

White: Prestige O Black: Mephisto X

1.e4 d5 2.exd5 Qxd5 3.Nc3 Qd6 4.d4 Bf5 5.Qf3 Qe6+ 6.Be3 c6 7.Bc4? (White should not help black to unravel his terrible position.)

7 . . . Qxc4 8.Qxf5 e6 9.Qe5 Nd7 10.Qg3 Ba3 (A strange move which humans are not likely to play.)

11.Bc1 Bb4 12.Nge2 Bxc3+ 13.bxc3 g6 14.Qc7 (Both computers love to attack b-pawns.)

14 . . . Qa6 15.Rb1 b5 16.Rb2 Ne7 17.0-0 Nd5 18.Qg3 N5b6 19.Qf3 Rc8 20.a3 (White is afraid of Nc4 and Qxa2. Now if 20 . . .Qxa3 then 21.Rxb5 wins back the pawn.)

20 . . . 0-0 21.Bh6 Rfe8 22.Ra1 f5 23.Rbb1 Nc4 24.Rb4 e5 25.Rb3 (White is wasting an unbelievable amount of time with these rook moves.)

25 . . .Qa4 26.Qd3 e4 27.Qh3 Na5 28.Rb2 c5 29.d5 Nc4 30.Rba2 Nf6 31.Nf4 Nb6 32.d6 Red8 33.Rd1 Rc6 34.Qg3 Rcxd6 35.Rxd6 Rxd6 36.Nd5?? (An astonishingly short-sighted blunder, not at all typical for the Prestige. White overlooks the fact that after 36 . . .Rxd5 37.Qb8+ Kf7 there is a threat of back-rank mate that prevents him from winning back the knight. Mephisto has just been given a piece for nothing!

On the adjacent board the Sensory 9 is winning against Superstar, but both computers are in bad time trouble. The operator of the SciSys machine offers his opponent a draw and is turned down.)

36 . . .Rxd5 37.Qb8+ Kf7 38.h3 Qc4 39.Ra1 Qxc3 40.Rb1 Qxc2 41.Rxb5 Qa4 42.Rxc5 Rd1+ (After 42 . . .RxR 43.Qf8+ wins back the rook.)

Meanwhile, on another table, the Superstar-Sensory 9 game has reached a climax. Superstar calmly computes its 38th move in the last minute of its clock time, the petrified operator hardly daring to breathe. He has offered a draw a second time and has been turned down again. Literally seconds before the flag falls Superstar finally makes the move.

Now the Fidelity people stop breathing. They have a little over three minutes on the clock and it is perfectly clear that they will win the game if their computer makes the next move in time. You can almost hear the prayers of Peter Reckwitz, Fidelity's German importer, who is operating the machine. If it loses on time the blame is sure to fall on him. You always blame the operator for being too slow entering and executing moves.

With Peter Reckwitz growing crimson and the public squealing in excitement, Sensory 9 shows absolutely no sign of concern. It serenely goes on computing until the flag falls. Fidelity has lost a very important point, and with the Prestige game going down the drain spirits in the team are very, very low.

43.Kh2 Ne8 44.Re5 Rd3 45.Be3 (Mephisto has an overwhelming advantage of a piece and a pawn, but now it is his turn to miscalculate.)

45 . . . Nc4? 46.Rxe8 Qxe8 47.Qc7+ Kf6 48. Qxc4 (Now Prestige is only the exchange and a pawn down, still completely lost, of course, but with a glimmer of hope that there may be a god-sent draw somewhere.)

Qe5+ 49.g3 a5 50.Qa6+ Qd6 51.Qxa5 (After an exchange of queens black would have no difficulty using his remaining material advantage to win the game. White must retain queens and try to operate with perpetual checks.)

51 . . . Rxa3 52.Qb5 Rd3 53.Qb2+ Ke6 54.Kg2 h5 55.Qg7 Kd5 56.Qb7+ Qc6 57.Qf7+ Qe6 58.Qb7+ (White is quite obviously playing for a draw. The Mephisto team, which was really enjoying this game, is now somewhat subdued.)

58 . . . Kd6 59.Bf4+ Kc5 60. Qa7+ Kb5 61.Be3 Qc6 62.Qb8+ Kc4 63.Qe5 Kb3 64.Qb8+ Kc3 65.Qb1 Kc4 66.Qa2+ Kb5 67.Qb1+ Ka5 68.Qb2 Ka4 69.Qa1+ Kb4 70.Qb2+ Rb3 71.Qd4+ Ka5 72.Qa1+ Kb5 73.Qe5+ Ka6 74.Qa1+ Kb7 75.Qg7+ (Ossi Weiner can't take much more of this. His computer is making no progress and seems to be heading for a draw. Peter Reckwitz has come to watch and is beginning to make deprecatory remarks.)

75 . . . Qc7?? (To the horror of the Mephisto team black decides to sacrifice two of his pawns to avoid further checks!)76.Qxg6 Qd7 77.Qxh5 Rb5 (White now has a dangerous passed pawn on the h-file. Of course black can still draw fairly easily, but with Mephisto X in the mood it's in, anything can happen. Ossi Weiner can hardly wait for the imminent adjournment and adjudication by the master, who is sure to give him a draw.)

78.Bf4 Qc6 79.Qf7+ Ka6 80.Be3 Ka5 (Both computers have made the time control with plenty of time on the clocks.)

81.Bd2+ (The excited murmurs around the board turn to cries of outrage: Ossi Weiner refuses to enter this move into his computer! The technical arbiter tells him he must do so, but Weiner argues that nothing in the rules make this mandatory. He goes away to phone his boss in Munich.)

81 . . . Ka6 82.Be3 Rd5 83.g4 (Thomas Nitsche has entered these moves, but now even he refuses to go on. Weiner returns and Peter Reckwitz, a big man, begins yelling, telling Weiner he will slaughter him in the press for this. Weiner, a small, delicate person, turns pale and refuses to operate the

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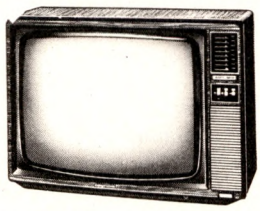
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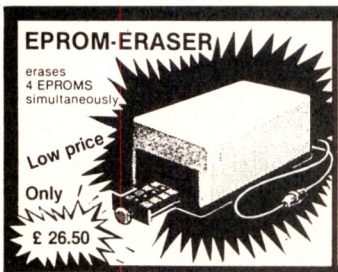
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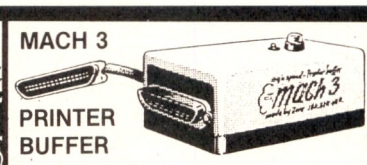
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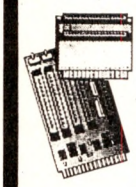
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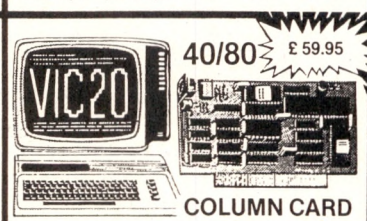


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Continued from page 221

machine. The arbiter is not sure what he should do and decides to postpone a final decision until the international jury can be summoned the next day. For purposes of pairing the game is tentatively adjudicated a draw.

The next afternoon the international jury interviews all involved and decides that the spirit of the rules are quite clear and requires the operator to enter the opponent's moves at all times. He is not allowed to slow down the game for strategic reasons. It issues a reprimand to the Mephisto team for attempting to circumvent the rules' and also express strong disapproval of the 'emotional and hostile behaviour of the Fidelity representative'. It rules that the game must be 'resumed at the point where it was left, that the level of play be reset to the level of the previous evening and that the game be played on for an additional 45 minutes' (the approximate total time lost during the incident.)

83 . . . Qd7 84.Qg8 fxg4 85.hxg4 Kb5 86.Qg6 Re5 87. Qg8 Qe6 88.Qg7 Rd5 89.g5 Qg4+ 90.Kh2 Qh5+ 91.Kg3 Qf3+ 92.Kh4 Kc6 (The 45 minutes are over and the arbiter studies the position. After a short time he adjudicates it a draw.

There is a collective sigh of relief. Everyone is happy with the solution. The same evening Weiner and Reckwitz are observed drinking a beer together and joking boisterously . . .)

In the seven round Swiss style tournament no computer was allowed to play against another machine from the same manufacturer. This naturally made for strange pairings, and some very striking oddities in the final results

1. Elite A/S	6
2. Mephisto X	5
3. Novag X	5
4. Super Constell	5
5. Prestige	4.5
6. Chess 2001	4
7. Gedeon	4
8. Chess 2001 X	3.5
9. Mephisto Y	3.5
10. Mephisto Excal.	3
11. Constellation	3
12. Sensory 9	3
13. Superstar X	3
14. Micromurks	2.5
15. LogiChess	2
16. Chess Master	2
17. Cyrus X	2
18. Labirint	0

Fig 1. Results: Third World Microcomputer Chess Championship

must be considered a result of the system. It is interesting to note, for example, that the Prestige and the Elite A/S have identical playing codes. Still, the *slower* machine fared much better. Of the three virtually identical Mephisto machines, one came in 2nd and the other two, 9th and 10th.

The winner of the tournament — a full point ahead of the rest — was the Elite A/S, followed by Mephisto X and Novag X. The prize for the best amateur program was won by Mikromurks. The final results are shown in Fig 1.

The current Computer World Champion Belle was defeated in New York by Cray Blitz, a program running on a 0.2 Gigaflop machine (Cray X-MP). Tony Harrington will be back next month with an account of the New York championship.

Games section

White: Belle. Black: Cray Blitz. World Computer Championship, New York 1983. Sicilian Defence. Notes by David Levy.

This was the game that everyone had been waiting for. If Belle had won the game, there would have been a 3-way tie for first place, with Belle winning on tie-break.

1	e2-e4	c7-c5
2	c2-c3	

(A move which was rarely seen a decade ago, but which is now rather popular in human tournaments and in computer events. If Black does nothing, his opponent will build a strong pawn centre with d2-d4. The only two moves which come into serious consideration are 2 . . . Ng8-f6 and 2 . . . d7-d5.)

2	. . .	d7-d5
3	e4xd5	Qd8xd5
4	Ng1-f3	

(The move order 4 d2-d4 e7-e6 5 Ng1-f3 is somewhat more usual.)

4	. . .	e7-e6
5	d2-d4	Ng8-f6
6	Bf1-d3	Nb8-c6

(Both 6 . . . c5xd4 7 c3xd4 Nb8-c6, and 6 . . . Be7, are more often seen.)

7	0-0	Bf8-e7
8	Bc1-e3	0-0
9	d4xc5	Rf8-d8
10	Nf3-d4?!	

(This move allows Black to retain most of the pressure in the d-file. White should have been content to trade queens and maintain a very small edge by 10 Bd3-e2 Be7xc5 11 Qd1xd5 Rd8xd5 12 Be3xc5 Rd5xc5 13 Nb1-d2.)

10	. . .	Be7xc5
11	c3-c4?!	

(Parting with control of two important squares, b4 and d4. White should probably play 11 Nd4xc6, and if 11 . . . Qd5xc6 12 Qd1-e2; or if 11 . . . b7xc6 12 Be3xc5 Qd5xc5 13 Qd1-e2, with roughly equal chances in each case.)

11	. . .	Qd5-d6
12	Nd4xc6	b7xc6
13	Be3xc5	Qd6xd3
14	Qd1-a4?	

(After this move, Black's advantage is clear. The correct plan was to trade queens: 14 Qd1xd3 Rd8xd3 15 Nb1-c3, and if 15 . . . Nf6-d7 16 Nc3-a4.)

14	. . .	Nf6-e4
15	Bc5-b6	

(Naturally not 15 Bc5xa7?? Rd8-d7, winning the bishop. But better than the artificial text move would have been simply 15 Bc5-e3.)

15	. . .	Rd8-d7
16	Bb6-a5	Bc8-b7
17	Nb1-c3	Ne4-c5
18	Qa4-b4	Qd3-d4
19	Ra1-d1	Nc5-d3
20	Qb4-a4	Qd4-g4

(Threatening 21 . . . c6-c5!, opening the b7-g2 diagonal, as well as the more prosaic 21 . . . Nd3xb2.)

21	c4-c5	Qg4-f5

(Now White must lose at least a pawn, but Belle makes the wrong decision and decides that rather than give up a pawn it will sacrifice its queen for rook and minor piece. This trade is materially equivalent to a pawn, but the queen is much more powerful in this type of position and White's bishop is left completely out of play. This type of error in judgement is what still makes it possible for the strongest humans to win against the strongest computer programs.)

22	b2-b4	Nd3-b2
23	Rd1xd7	Nb2xa4
24	Nc3xa4	Qf5-c2
25	Rd7xb7	Qc2xa4
26	Rf1-a1	

(White has poorly coordinated forces, and can offer little resistance to the raging black queen.)

26	. . .	e6-e5
27	f2-f3	Qa4-c2
28	Rb7-c7	Qc2-d3

(Threatening 29 . . . Qd3-d4+, forking king and rook.)

29	Ra1-f1	Qd3-d5
30	a2-a3	g7-g5
31	Rc7-e7	f7-f6
32	Re7-c7	h7-h5
33	h2-h3	Kg8-h8

(A typical computer move — when in doubt, put the king on a safer square!)

34	Kg1-h2	a7-a6
35	Rf1-e1	Ra8-e8
36	Re1-e4	f6-f5
37	Re4-e2	g5-g4!
38	h3xg4	f5xg4
39	f3xg4	h5xg4
40	Re2-f2	e5-e4
41	Rf2-f7	Qd5-e5+
42	g2-g3	e4-e3
43	Rf7-h7+	Kh8-g8
44	b4-b5	

(Sacrificing a pawn in order to slow down the advance of the Black e-pawn, but it soon becomes clear that White must lose even more material.)

44	. . .	c6xb5
45	Ba5-e1	Qe5-b2+
46	Kh2-g1	Qb2-a1
47	Kg1-g2	Qa1-f6

(Not 47 . . . Qa1xe1?? when White can draw by 48 Rc7-g7+ Kg8-f8 49 Rg7-f7+ Kf8-g8, etc.)

48	Kg2-h2	Re8-d8
49	Rh7-d7	

(Black was threatening 49 . . . Rd8-d1.)

49	. . .	Rd8-f8
50	Rd7-d6	Qf6-b2+
51	Kh2-g1	Qb2-b1
52	Kg1-h2	Qb1-c2+
53	Kh2-g1	Qc2-c5

Resigns

(There is no satisfactory defence to the threat of 54 . . . Qf5-f1+ 55 Kg1-h2 Qf1-e2+ and 56 . . . Rf8-f1 mate.)

(The king is dead, long live the king!)

A booming business

The UK home computer market experienced a dramatic boom in 1983, with sales surpassing expectation and, in some cases, demand exceeding production. Margaret Spooner went shopping for the stories behind the figures.

'It's a bit like trying to fill a bottle with a hole in it.' That's how Peter Jackson, marketing director of Rumbelows, describes the problem faced by many home computer manufacturers in the pre-Christmas period last year. If Christmas '82 saw the start of the boom in home computer ownership in the UK, Christmas '83 reinforced it. After a year of uncertainty for home computer manufacturers it must have been pleasing to find the market so buoyant, even if it did create problems keeping up with demand. But do the 1983 home computer sales figures reveal a continuing demand in this market? How is the market shared between manufacturers and how does the UK compare to overseas countries in its buying of home computers?

Demand

At the beginning of December, well before the final stampede of Christmas buying, business was so brisk at Rumbelows that Peter Jackson predicted a final figure of 1.6 to 1.8 million home computer sales in the UK for 1983. This was a somewhat higher estimate than most industry commentators had been willing to give. The general consensus before Christmas trading began was closer to one million units. Jackson justified his figure by noting the 'tremendous leap forward in sales' that had already occurred in November and early December, and seemed likely to continue into January and February. But he cautioned: 'The final figure hinges on the availability of hardware between December and February.'

The three top selling computers at Rumbelows stores are the Sinclair 48k Spectrum, Commodore 64 and VIC 20 (also from Commodore). 'Although both manufacturers are having trouble keeping up with demand they are managing to stay ahead,' said Jackson. Commodore machines were in stock in early December but prospective Spectrum owners were having to wait a week for Sinclair to meet their orders.

Customers going to Laskys to buy a Spectrum were not so fortunate. Marketing director Bob Cox said: 'A lot of people start out with a Spectrum in mind — after all it is the best known home computer — and then they move upwards. Oric has benefited from the lack of Spectrums.' Oric expected its final sales figure for 1983 to be about 120,000 but this includes sales overseas. Cox added that 'the supply problem distorts the true pattern of customer demand. We sell the ones we can get hold of.'

Asked about the lack of Spectrums a Sinclair spokesman agreed that some retailers had experienced shortfalls but said this was not entirely Sinclair's fault; retailers had left it rather late to place bulk orders — possibly an indication of their doubts about the level of public demand for home computers. Although Sinclair had anticipated heavy demand by stockpiling 100,000 computers in the summer (this could equate with its admission of a 'sluggish summer market'), all these plus those produced in September were sold by early December. In one week alone at the end of November the company received orders for over 200,000 machines. It attempted to meet the

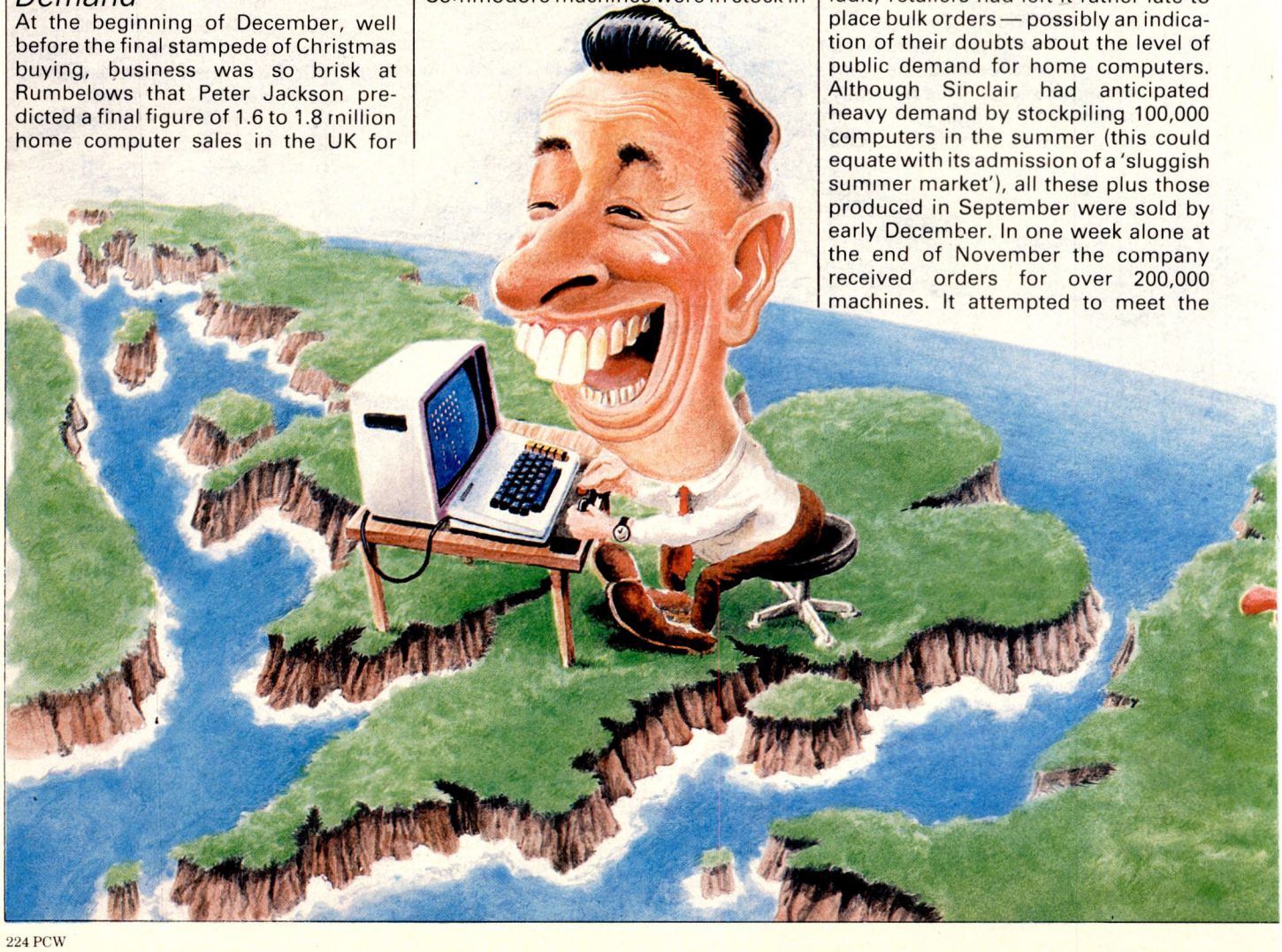


Illustration by Nick Davies

demand by balancing deliveries to the six retailers whom it supplies directly and to Prism, the distribution organisation which feeds all the other outlets for Sinclair computers.

The shortfall was expected to be temporary. Sinclair's spokesman expressed regret about the situation but was sure that customers who shopped around would have found a Spectrum before Christmas, because 5,500 retailers throughout the UK stock Sinclair home computers. And the number one supplier of home computers, WH Smith, reported no difficulties in meeting demand for them.

Problems

Sinclair was not the only company facing supply problems in the pre-Christmas period. Acorn failed to keep up with the demand for its Electron, the new baby brother to the BBC Micro. This was because demand was so high, said an Acorn spokesman — 'rather like the BBC Micro when it started.' (Surely something should have been learnt from that experience?) Acorn was not happy about it: 'It's unfortunate because it doesn't create a good feeling about the company.'

However, the Christmas period is not typical of the year as a whole. For many home computer manufacturers 1983 was fraught with anxiety. The market became overcrowded as quite a number of new products were released; prices were cut in an attempt to be competitive and as a result losses were made by some (Atari, for example); others fell by the wayside (Osborne and the Jupiter Ace); Dragondata was the subject of a rescue effort as it too faced liquidation; Texas Instruments announced its withdrawal from the home computer market; Mattel gave up the Aquarius and NewBrain production ceased. Despite this it seems certain that the number of units sold in 1983 will be twice as many as were sold in 1982. A large proportion of these sales occur in the busy final quarter of the year. A Mintel analyst commented: 'It's a difficult market to look at because it moves so quickly.'

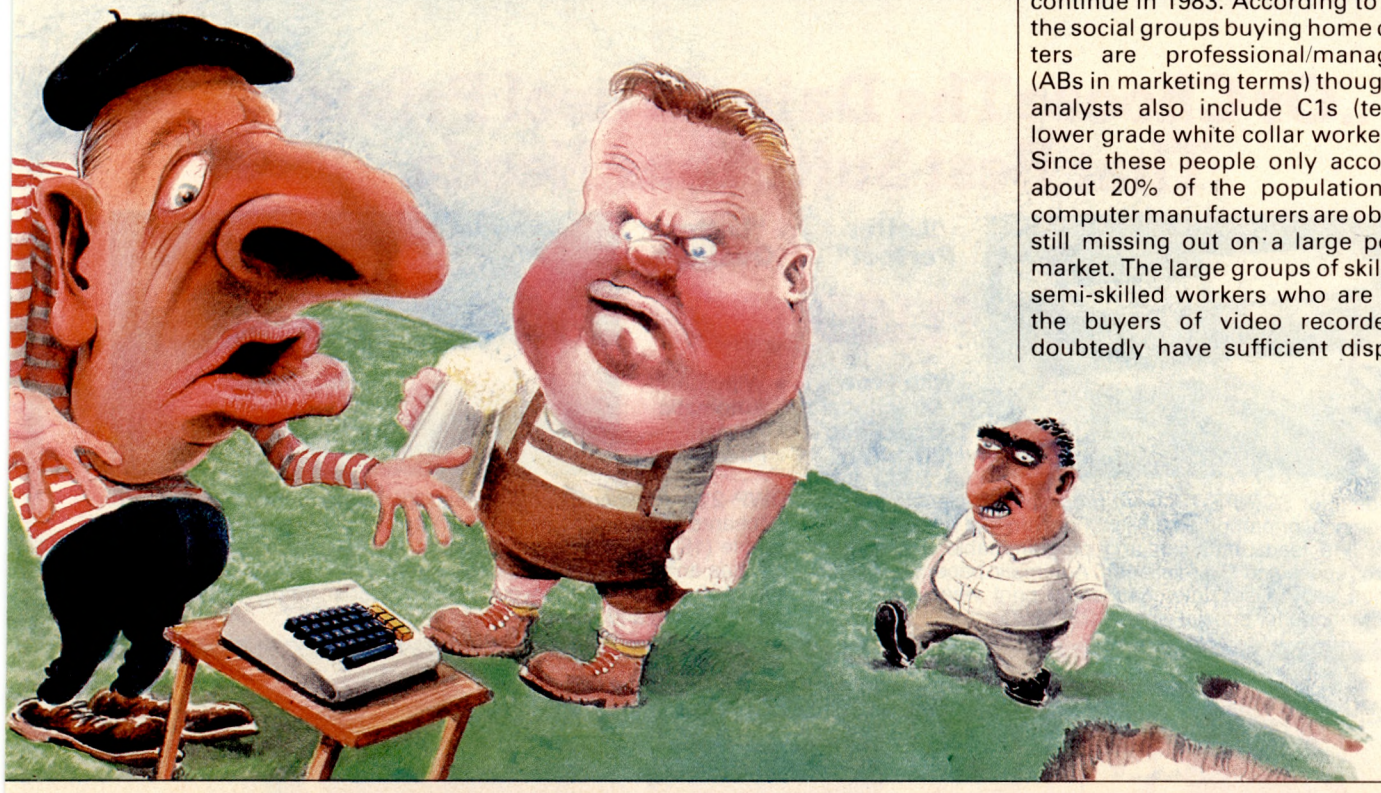
A survey conducted by Mintel estimated that hardware sales in 1983 would amount to £216 million representing 1¼ million home computers. In addition it predicted sales of peripherals worth £30 million and software sales of £54 million. Other side effects include increased sales of books (WH Smith has over 400 computer book titles available on call in its warehouse and over 100 in stock in most branches). Smiths also stocks magazines (computer interest titles outnumber women's interest magazines) and reports higher demand for battery-operated cassette recorders.

IDC Europa expects 1983 UK shipments to be 900,000 units. This would show a growth of 105% over the 1982 figure of 450,000. IDC believes that Sinclair holds 57% of the UK market in terms of units sold and Commodore follows with 20%. A spokesman for Sinclair Research said: 'Dependent on supply and actual sales over the few weeks to Christmas we are projecting a final sales figure for 1983 of 800,000 units for both the ZX81 and the Spectrum.' About three quarters of this figure will be Spectrums. To the end of September, Commodore had sold 260,000 VIC 20s and 90,000 Commodore 64s and expected to add another 150,000 to each of these figures by the end of the year.

In the UK the other major name on the home computer scene is Acorn, and although the company said it was too soon to give sales estimates for the Electron, it anticipated sales of 120–130,000 BBC Micros in 1983 and has passed the 200,000 production mark since it started. The success of the BBC Micro (which has quite a high price tag at £399 compared with most home micros), is undoubtedly due to its association with BBC Television's *Computer Programme*. Even so, some people did not expect it to be quite so successful. A spokesman for WH Smith said: 'When our first computer shops opened we were surprised at the amount of interest shown in the BBC computer. Parents are interested in it for home education — they are becoming aware that children should be given the chance to use at home what they are introduced to at school. Home computers provide an educational centre for all levels of the family as well as being a family leisure centre.'

Buying patterns

Bob Cox at Laskys went even further in his comments on who is buying home computers and why; he suggested that 'parents daren't let their children *not* have one. People are scared their child will get left behind.' These views are supported by market surveys of people buying home computers. Mintel conducted an ownership survey at the end of 1982, at a time when home computers were fairly evenly distributed throughout all regions of the UK, but were generally confined to young people and 35 to 44-year-olds in the more affluent sections of society. The 35 to 44-year-olds were mostly buying them for their children's benefit and men were the major purchasers. Mintel asked others if they would like to own a computer and the answers confirmed that this pattern of buying was likely to continue in 1983. According to Mintel, the social groups buying home computers are professional/management (ABs in marketing terms) though other analysts also include C1s (teachers, lower grade white collar workers, etc). Since these people only account for about 20% of the population home computer manufacturers are obviously still missing out on a large potential market. The large groups of skilled and semi-skilled workers who are among the buyers of video recorders undoubtedly have sufficient disposable



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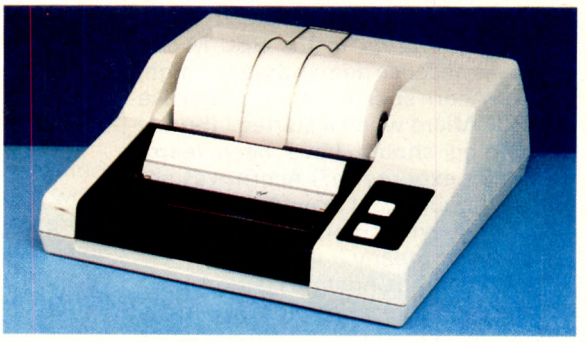
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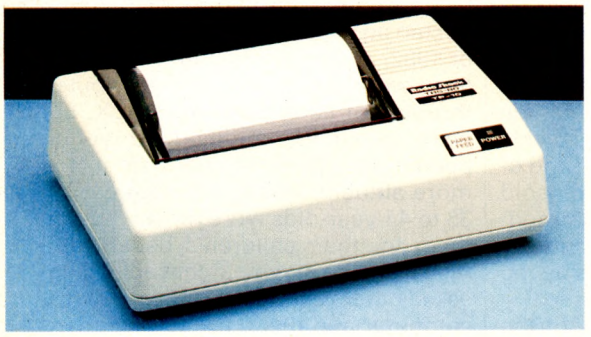
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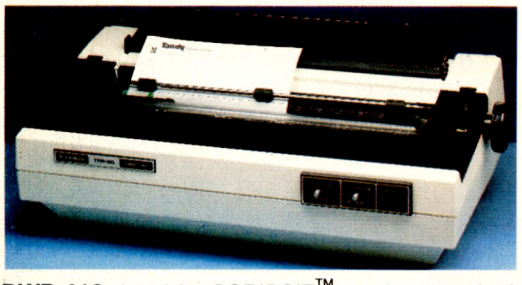
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continued from page 225.

income to afford a home computer but have not yet been beguiled into buying.

How do manufacturers persuade people to buy a particular computer? Advertising is the most obvious method and there was a noticeable spate of it in the pre-Christmas season. One company at least was making efforts to appeal to a wider audience in the autumn. Commodore had a major advertising campaign with a high profile television commercial showing a mouse nimbly running over the keyboard of a Commodore 64 followed by an elephant waving the computer about. The association of elephants with memory is presumably intended to imprint itself in viewers' minds to emphasise the large size of the machine's memory (at least compared to most home machines).

Similar advertisements featuring elephant, mouse and computer were placed in the national press and trade magazines to reinforce the television advertising and ensure that people remembered the name. John Baxter, marketing manager of Commodore, said the advertisements were directed at all social classes but with a bias toward parents with children. 'We aim to get the person's attention. When a person goes out to buy a home computer it is a considered purchase — we want to make sure they include ours among their alternatives.' A packaged system or starter pack is another marketing technique which manufacturers use effectively in the UK. The VIC 20 is sold in a starter pack which includes the processor, cassette unit, an introduction to Basic programming and four games.

Apple Computer recently adopted the packaged approach to increase sales of its Apple II into the home market. 'I wouldn't estimate that more than 5% go into the home market,' said Apple's marketing services manager, Michael Spring. Nevertheless, in 1982 'we noticed an upsurge in sales through retail outlets at Christmas. It could have been the success of a promotion we'd just done, but some were going into the home, which was interesting as we didn't view that as a target market. We researched it and found that where people had a business justification for a computer at home they would buy one and then use it for education, menu planning, home finance and so on.'

So for Christmas 1983 Apple decided to encourage such purchases by offering a packaged system, the Apple Professional Home Computer System which included an Apple II processor, disk drive and controller card, TV modulator link to a normal television set plus various other inducements, including a sports bag and user magazine, etc. At under £1000 excluding VAT this is obviously at the high end of the home computer market, but Bob Cox said the Apple package had sold well in Laskys' stores, with the further attraction of a training weekend at the end of November being offered to people buying the system. Spring said: 'We'll always have an interest at the more serious computing end of the home market.'

Serious computing may await Apple II but what is the fate of the million or so lower priced computers finding their way into UK homes? It seems they are mostly being used for playing games, despite the avowed intentions of purchasers to use them for educational purposes too. One of the casualties of the craze for games playing on home computers is the video game — manufacturers of these may well have seen the last of their business at Christmas.

Will games playing remain the overriding use of computers? 'The easiest thing to do with a new computer is to play games,' said Adrian Rushmore of Tansoft. However, he suggests that 'once the excitement of playing games has died down, people sit back and appraise the situation and ask what more they can get out of their machine. So follow-up sales are for a different type of package.' An increasing interest in educational software was noted by WH Smith with more becoming available in the second half of 1983, mostly for the Spectrum and BBC computers.

'It seems odd that with less disposable income than many Europeans, people in the UK are so willing to buy home computers . . .'

Distribution and purpose

The boom in home computer sales in the UK has not occurred to the same degree in other European countries.

Home computer sales 1983

Manufacturer	Machine	Estimated number of units sold in 1983
Sinclair	Spectrum	600,000
	ZX81	200,000
Commodore	VIC 20	410,000
	CBM 64	240,000
Acorn	BBC	100,000
	Electron	no estimate
Oric	Oric 1	70,000
Dragondata	Dragon 32	100,000
Texas Instruments	TI 99/4A	does not reveal sales figures

The fact that the Spectrum is a home grown product has contributed to the success of home computers in the UK. Sinclair is also the volume shareholder in the European market with 45% of the market against Commodore's 28%, and Texas Instruments takes third place with 7%. Distribution has played a part in the success of home computers in the UK; large retail chains took up home computers and they became readily available in high street outlets. An IDC Europa analyst pointed out that games playing is not so enthusiastically received in Europe so that, even where suitable distribution chains exist they have been less eager to respond to the arrival of home computers. Apparently, the French need to see an educational reason for buying a home computer and the Germans need a serious purpose for their purchases. It's not surprising that home computers have not made such inroads in these markets with their current strong games-playing image.

The British are obviously a frivolous lot — quite prepared to play games for the sake of playing games. It seems odd that with less disposable income than many Europeans, people in the UK are so willing to buy home computers — perhaps the initial outlay is regarded as worthwhile to gain home-based entertainment?

Commodore's share of the European market is greater than it is in the UK because it was on the continent before Sinclair. A Commodore's official spokesman believes Europe is a year behind the UK in its response to home computers while the UK is ten years behind the United States. There Commodore has its largest market. It sold 1.6 million VIC 20s and half a million 64s in the first three quarters of 1983. The price of the computer is lower in the US and a greater profit margin is allowed on peripherals and software, while the starter pack concept is unique to the UK. Marketing strategies are different in all countries according to historical and cultural traditions.

Whether European countries will follow the UK in the extent of their home computer purchase this year remains to be seen. But one thing is certain: 1984 will be an interesting year, for it is expected that IBM will launch its home computer, the PC Junior, in the UK in the spring. The IBM PC is not seen as a home machine here although it is sold for home use in the US. However, IBM is an impossible company to ignore — it was certainly difficult to miss its massive advertising campaign for the Personal Computer in the autumn. The awareness this created *must* carry forward to the launch of the PC Junior. Just how many companies can withstand the presence of IBM with its marketing ability is a matter for conjecture, but this time next year will surely have produced a shake-out of the home computer market.

END

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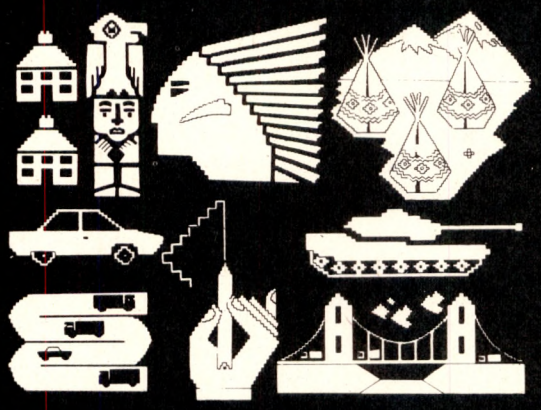
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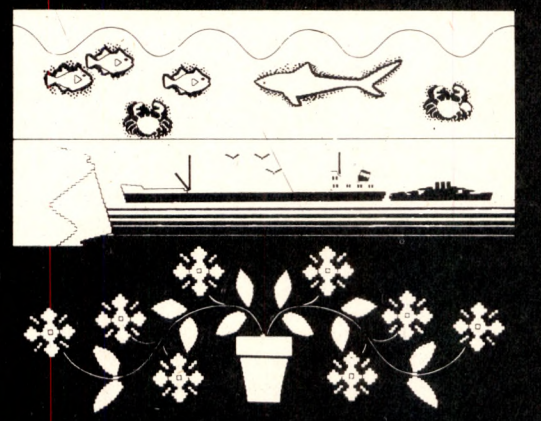
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Bricklin's Vision

Dan Bricklin is one of the most influential software writers of all times. So what does he think of the current state of the art? Well, the days of menu-driven software are numbered . . . Mike Liardet reports.

Dan Bricklin is one of the two authors of what is the world's most successful software package. With a few intensive months of coding back in the late seventies he and his partner, Bob Frankston, wrote VisiCalc. This introduced a new type of software — the spreadsheet, giving the computer industry the biggest 'kick in the pants' since the introduction of the micro. The outcome of their work is that now no self-respecting micro-manufacturer will release a machine without spreadsheet software available.

Dan Bricklin was recently in the UK to speak on the 'State of the Art', and I rushed along to hear what he had to say and fill in the gaps with an interview.

He began by defining mainframes, minis and micros. The important point is that minis are really scaled-down mainframes, but micros are not just scaled-down minis. In fact if you try to use them that way, then the results can be disappointing. What micro-technology has to offer is 'high-bandwidth' VDUs — screens that can be completely redrawn in an instant by a processor which can be almost exclusively dedicated to doing just that.

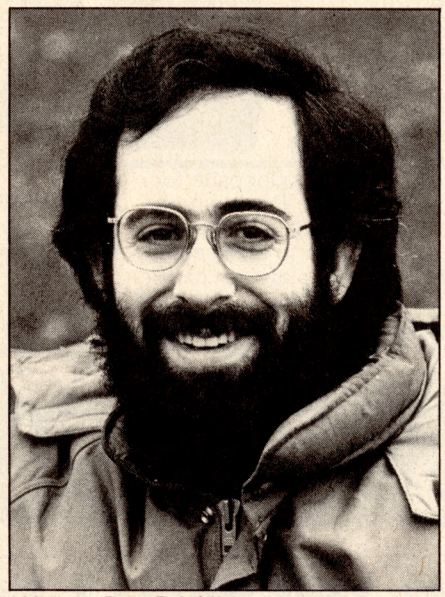
The high-speed VDU technology simply didn't exist at a reasonable price until recently, and it is only a few 'state of the art' software packages that really try to maximise the advantages of it.

Bricklin chose the following as worthy of special mention.

***VisiCalc.** The software that began spreadsheet systems would not really be feasible without a screen that is immediately responsive. With VisiCalc (see *PCW*, June '83) the screen acts as a 'window' on a large sheet of numbers. The window can rapidly be moved from place to place only because dedicated micros can attain the necessary speed to redraw the screen frequently and at the whim of the user.

***TK!Solver.** This is Software Arts' latest product (reviewed in this issue) and it uses similar interactive techniques to VisiCalc. As with all the products Bricklin mentioned, the concept of windowing is central to the interaction.

But TK!Solver also introduces a new interactive feature, almost like adding a third dimension to the windowing



Above: Dan Bricklin

'Instead of menus we can look forward to seeing all the options hovering at the top of the screen . . .'

concept. Bricklin terms this new feature 'diving', following the TK!Solver terminology. The idea is that in general an area of the screen may contain only a title or brief summary on some point. By pointing at it, and giving the appropriate command, we can 'dive into' that area and find out much more, as the new screen display will be wholly devoted to it.

***Lisa.** Moving away from Software Arts' products, Bricklin introduced some of the interactive concepts underlying Apple's Lisa software (see *PCW*, July '83). Like the previously mentioned products, Lisa uses 'diving' and 'windowing' and it introduces other new concepts. Instead of screen displays with just words, images or 'icons' are used. Visually, pictures are more stimulating than text, and may be easier to work with, but the windowing/diving is essentially unchanged.

***The Mouse.** A mouse is a small box which slides across the desk, causing the screen marker or cursor to move along with it. Bricklin thinks it should be equipped with a full integral numeric keypad instead of the two or three buttons which are the current standard. He also reckons the current hostility to mice directly stems from the name, which 'simply is not macho enough!'

***Visi On and MS-Windows.** Two further software products mentioned by Bricklin, but so 'state of the art' that they are not yet available: Visicorp's Visi On (see *PCW*, November '83) and Microsoft's MS-Windows. Both these products will place the above-mentioned facilities at the beck and call of your average programmer. This is no small matter, because although the above-mentioned concepts are easy for a user to grasp they are extremely hard to code-up from scratch. Bricklin cited genuinely portable computers (as opposed to 'luggables', touch screens and electronic mail) as the state of the art in hardware. Lap-held portable machines such as the NEC and Tandy are extensively used by Software Arts for note-taking at meetings.

Not surprisingly Bricklin described his own company as state of the art. Having grown from two people in an attic in January 1979, it now employs 130 people and five Prime 850 computers in palatial premises on Boston's technology highway: route 28.

Last year, Software Arts received $8 million in payments for VisiCalc. Bricklin objects to the term royalties for this — 'A new version of Visicalc involves more work than, say, putting a Hemingway novel in paperback.'

The Future

Bricklin is tight-lipped about any future direction that Software Arts may take, although clearly it is committed to TK!Solver and we can look forward to a plethora of solver-packs and wide-ranging implementations of it.

Did he have any predictions? Well yes, menu-driven software will be extinct in another 10 years — the concept originated with a generation of programmers sustaining themselves with the numbered options in Chinese take-aways. Instead of menus we can look forward to seeing all the options hovering at the top of the screen, and the next generation of users will, with unerring accuracy, simply shoot down the one they want! END

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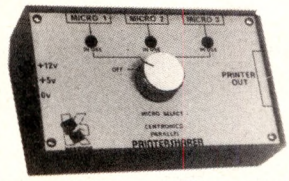
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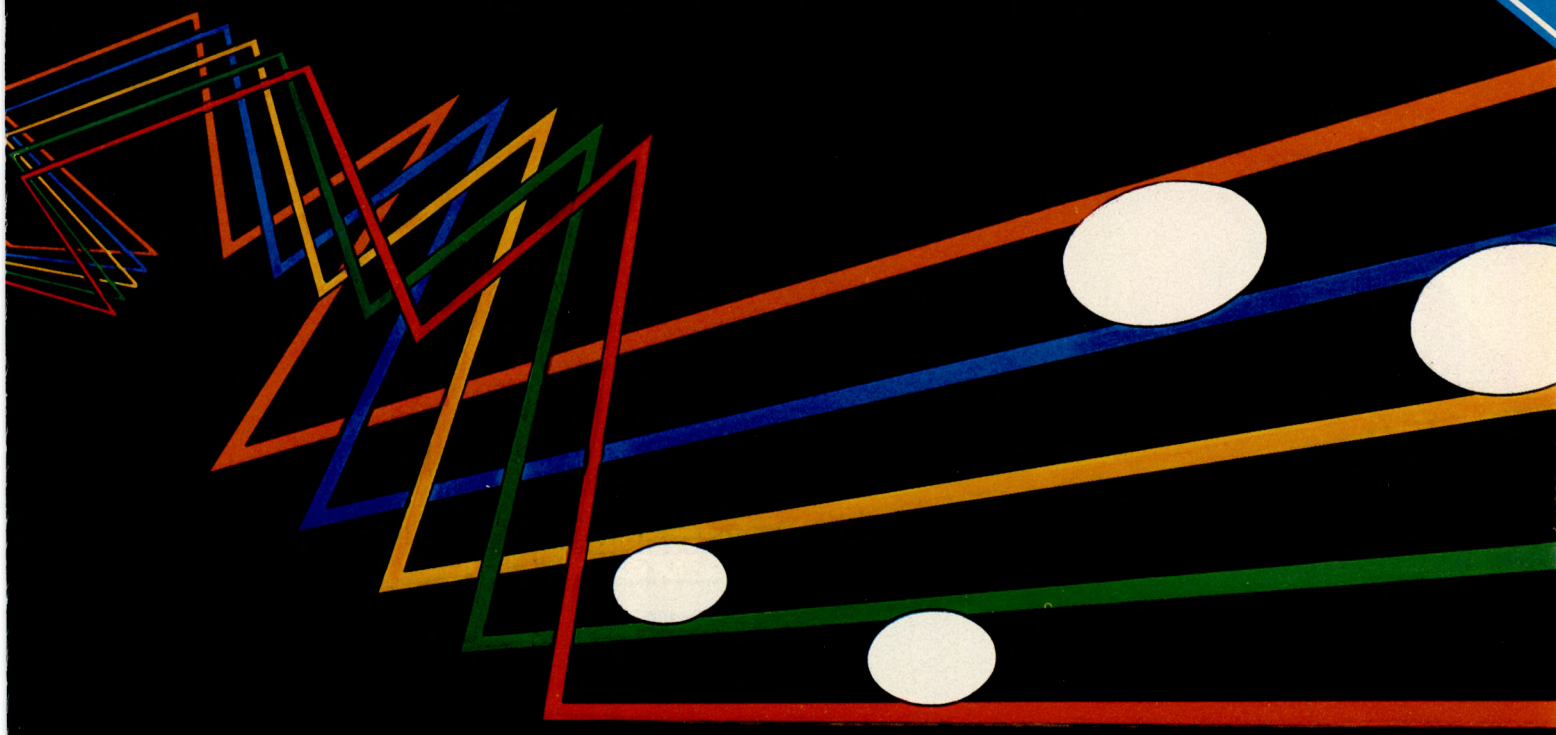
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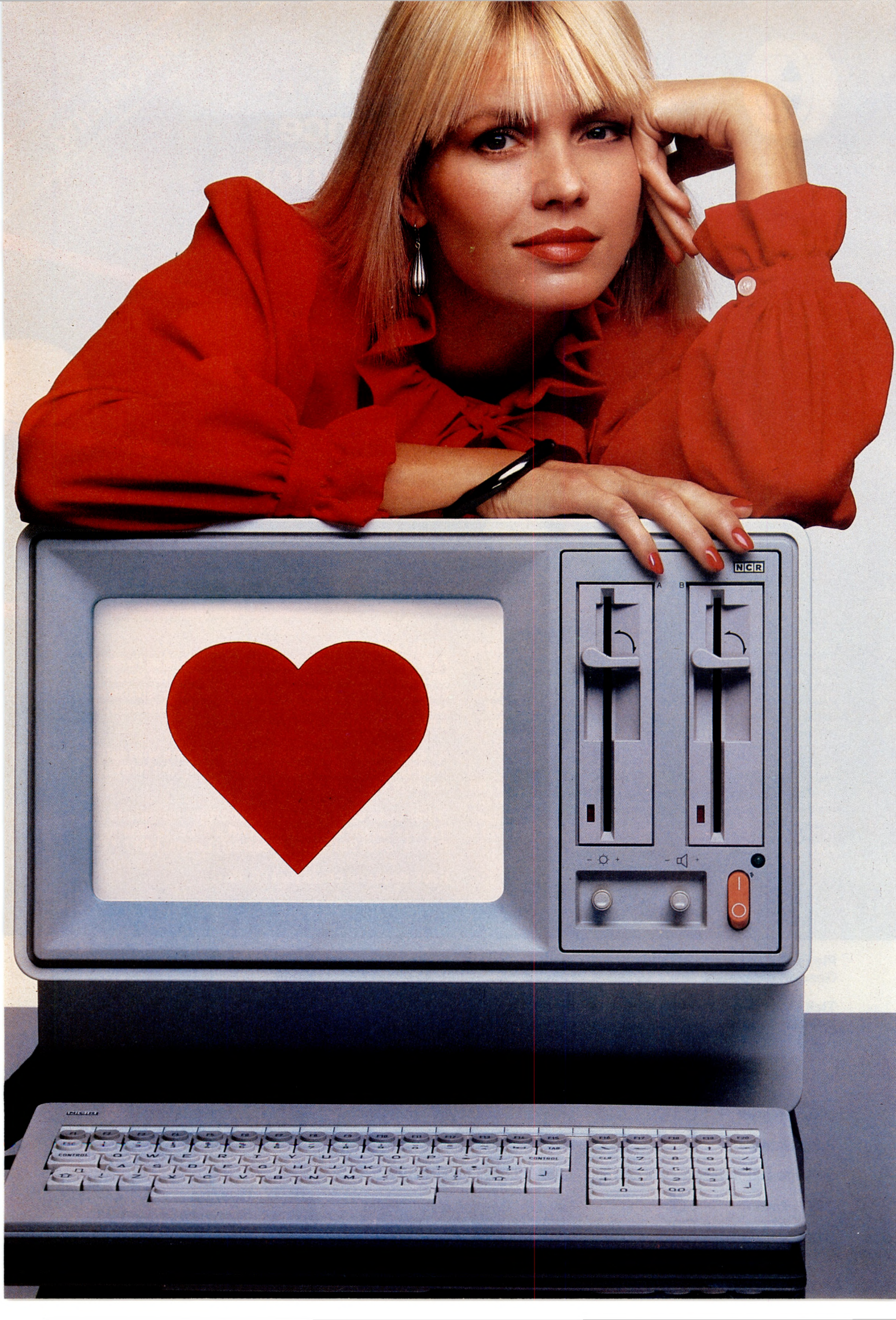
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MUSIC MICRO PLEASE



The final part of Music Micro, Please contains the Basic listing providing the user interface: it does the calculations needed to produce sounds.

Having typed in and recorded the two programs published in Part 2 (January '84) you now need to add this listing to the tape. Make sure when you produce your working tape that you leave about 30 seconds between each of the three programs to allow time for each to run before the next one is loaded.

The first thing the user will discover is that to synthesise a particular sound a number of tables must be constructed. There are five different types of table. To see what tables are available type "TABLE<RETURN><RETURN>" or "<f0><RETURN>" which should produce the output shown in Fig 4. When the program is run for the first time, the system sets up six tables called 'firsttune', 'firstfreq', 'firstenv', 'firstcont', 'firstwave' and '„'. All other tables (there are 12 left) are empty, and can be put to any use the user wants. These predefined tables, which cannot be deleted, provide the minimum information needed to synthesise a sound. In many cases, there will be no need to define any other tables.

The system works via a set of 13 commands which allow tables to be set up and altered. A summary of the different commands and their actions is shown in Fig 1. Let's now look at what the different types of table do.

Tune

The tune table contains about 40 sounds. The name of the current tune is always displayed at the bottom right corner of the screen. Further information referring to a sound within the tune is also available along the bottom of the screen. The frequency in Hz and the length of a sound in units (0 to 255) are shown as 'pitch' and 'duration'. The names of the three tables which decide the character of the sound are shown under the headings FREQUENCY, ENVELOPE and CONTROL. It may seem a little confusing to have the 'pitch' of a sound and the 'frequency' table characterising the sound. This is because the frequency must sometimes vary while the note is sounding to produce effects such as *vibrato* (see Part 1, December '83). Thus the 'pitch' is the basic frequency of the sound, about which instantaneous variations are caused by the frequency table.

Commands are available to move from sound to sound, and to insert and delete sounds from the tune (see Fig 1). The duration and pitch in Hz of sounds can be changed at any time using the DURATION (<f8>) and PITCH (<f9>) commands. When the pitch is entered, the program alters it to the nearest frequency that the software can produce. This value is then displayed as the pitch of the sound. The resolution of the system is a few Hz and the difference between the required frequency and the frequency which the system produces is inaudible. Often, the pitches required will be those of notes in the musical scale (see Fig 2).

Frequency

As mentioned above, this table together with the stated pitch determines the instantaneous frequency of a note. Thus it is possible to change the note's frequency while it is sounding. The table contains 256 values numbered 0 to 255. Each value is added to the pitch of the note to determine the frequency of the note for 1/256th of the time the note sounds. The value numbered 0 determines the frequency at the beginning of the note and the value numbered 255, the frequency at the end of the note.

Each number in the frequency table is one byte and so can take values from 0 to 255. When the table is first created, and if the table is cleared using the CLEAR command, all the 256 values in the table will be 128. This mid-value means the frequency is the stated pitch of the sound. A value in the table of 255 increases the frequency of the note by about 170Hz, and a value of 0 decreases the frequency of the note by about 170Hz from the stated pitch.

The TABLE command is used to select a frequency table. The contents of the table are plotted in the form of a graph with time horizontally, and frequency vertically. The command used to change values in the frequency table is SEGMENT (see Fig 1). When the SEGMENT command was first included, it produced straight lines from one point to another in the graph. It was thought that this would easily enable any shape to be produced. In practice, it was found necessary to provide something more flexible to produce effects such as the sinusoidal modulation needed for *vibrato*. Thus an extra feature called a 'modulation equation' was incorporated into the command. To simply draw a line on the graph the

user specifies the start position and value, end position and value and a modulation equation of zero. The two parts will be joined up and the graph redrawn.

The modulation equation is evaluated using the BBC's EVAL command. If modulation is needed, an expression is typed in which depends on the variable x% (lower case) which points to the value being calculated. For instance, to produce gentle *vibrato* about the pitch of the note, repeating every 10 values in the table, a segment from 0 to 255 with start and end values of 128 and a modulation equation of

5 * SIN(2 * PI * x% / 10)

would be used . In general, to produce sinusoidal modulation on a straight line with the SEGMENT command, a modulation equation will be of the form;

amplitude * SIN(2 * PI * x% / Period)

Envelope

The envelope table determines the overall volume of the note as it sounds. Like the frequency table it has 256 values numbered 0 to 255. A value of 0 gives no output and a value of 255 gives the maximum output. When the table is created, or cleared using the CLEAR command, all 256 values in the table are zeroed to give no output. Once again, the TABLE command is used to display the contents of the table as a graph.

The envelope is also altered using the SEGMENT command which can produce straight lines and, by imaginative use of the modulation equation, natural contours.

A good example is using the first half of a sinewave to form an envelope which smoothly rises to a maximum and then dies away again. In this case, we are bypassing the straight line aspect of the SEGMENT command and are defining our own function directly. For this reason the start and end values are zero and the modulation equation alone decides the envelope shape. The command is thus SEGMENT from 0 with value 0 to 255, also with value 0 and a modulation equation of

255 * SIN(2 * PI * x% / 512)

Waveform

The waveform table provides the basic waveform of the sound. Unlike the frequency and envelope tables, the waveform occupies two tables. As before, the waveform itself consists of 256 values, each in the range 0 to 255. Values are not, however, altered directly by the user. An HARMONIC command allows the strengths of harmonic partials and a noise component to be specified directly. As a result, information on the strengths of harmonics needs to be kept in a second table which has the name ',,' and appears immediately after the waveform table itself.

When a waveform is selected with the TABLE command, the user must decide whether he wants to see a graph of the waveform table giving the actual shape of the waveform (time display), or a display of the harmonic spectrum. The spectrum is a bar graph type display with the harmonic number along the bottom of the display. The fundamental is numbered '1' and the noise component is labelled 'N'. Every time the harmonic strengths are altered the display is redrawn to reflect the change.

Control

Every sound needs three tables to

Command	Function key	Description
TABLE	f0	Selects a particular table which will be displayed and included in the current sound. If the table requested is a tune table, changes to a new tune. If the table selected is unused the user can specify its new use.
HARMONIC	f1	Provided a waveform table has been selected with the TABLE command, changes the strength of a particular harmonic or the noise component in the waveform. The strengths of components must be integers. 16 harmonics are provided for; the noise is Pseudo-random.
SEGMENT	f2	If a control table is displayed, allows a different waveform to be specified for some time period. If a frequency or envelope table has been selected, adds a line segment from one point to another in the table. The start and end positions and start and end values must be specified. A modulation equation allows the user to add sinewave modulation to the lines, or to bipass the idea of lines altogether and to specify an arbitrary function.
NEXT	f3	Moves on to the next sound in the tune.
LAST	f4	Moves back to the sound before the current sound in the tune.
INSERT	f5	Inserts a blank sound infront of the current sound. A blank sound has a the frequency, envelope and control tables numbered 1, 2 and 3 ("firstfreq", "firstenv" and "firstcont" unless renamed).
DELETE	f6	Deletes the current sound from the tune.
PITCH	f7	Changes the Pitch of the current sound.
DURATION	f8	Changes the duration of the current sound. A duration of 0 gives the maximum duration of 256 units.
PLAY	f9	Plays the current tune.
CLEAR		Clears the displayed table (frequency tables are cleared to 128, all others to 0).
RENAME		Allows the name of the tune, or displayed table to be changed.
QUIT		Returns the user to BASIC. (Note that Pressing <ESCAPE> within the Program simply terminates the command being executed.)

Fig 1. Commands

Note	Frequency
C	130.8
C#	138.6
D	146.8
D#	155.5
E	164.8
F	174.6
F#	184.9
G	195.9
G#	207.6
A	220
A#	233.1
B	246.9
C	261.6
C#	277.1
D	293.6
D#	331.1
E	329.6
F	349.2
F#	369.9
G	391.9
G#	415.3
A	440
A#	466.1
B	493.8
C	523.2
C#	554.3
D	587.3
D#	622.2
E	659.2
F	698.4

Fig 2. Pitches in the musical scale

Harmonic	Amplitude
f	140
2f	350
3f	130
4f	740
5f	560
6f	180
7f	215
8f	250
9f	115
10f	50
11f	95
12f	68
13f	42
14f	48
15f	20

Fig 3. Harmonic strengths of violin tone

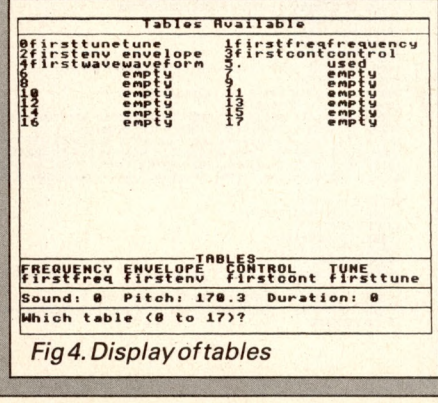


Fig 4. Display of tables

MUSIC MICRO PLEASE

characterise it fully for frequency, envelope and control. Waveforms are not specified directly because it may be desirable to change the harmonic content, in a similar way to volume and frequency, while the note sounds. The control table like the envelope and frequency tables has 256 values numbered 0 to 255. Each value determines the waveform for 1/256th of the time the note sounds. These values are changed by means of the SEGMENT command.

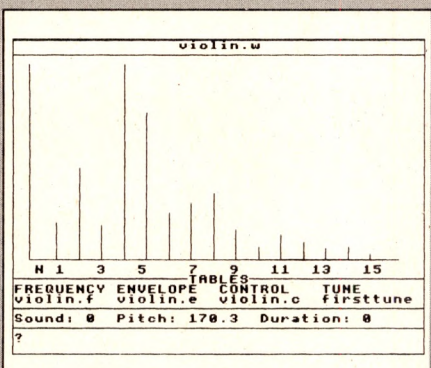


Fig 5(a). Spectrum display of violin waveform table

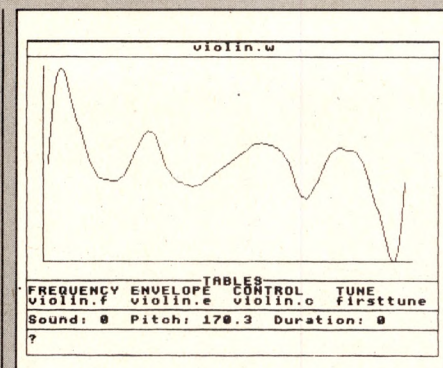


Fig 5(b). Time display of violin waveform table

The user specifies which value to start with, which to end on and the table number of the waveform to be used. The final value and modulation equation are no longer necessary.

An example

Let's now see how a particular sound is synthesised using a violin tone as an example. The violin is quite difficult to imitate and so our first attempt may not sound too accurate. However, it is easy to modify the tables and to hear what the difference is.

The strengths of the harmonics for a violin tone can be found in the *Computer Music Journal Lexicon of Analysed Tones* (April 1977). Unfortunately, the

Listing 3. SYN.BAS program

```
  10 REM******** Digisyn 0.3 ********
  20 REM (c) S.P.Tait 24th March 1983
 231 MODE4
1000 REM**********CONSTANTS**********
1010 noofables%=18
1020 noofbyPes%=7
1030 emPtybP%=6
1040 usedtP%=5
1050 freQuencybP%=0
1060 enveloPetP%=1
1070 controltP%=2
1080 tunetP%=4
1090 wavetP%=3
1100 minPitch%=170
1110 maxPitch%=10000
1120 Pitch%=3
1130 mindur%=0
1140 maxdur%=255
1150 dur%=5
1160 noofParams%=6
1170 noofharmonics%=16
1200 lastsound%=256/noofParams%-1
2000 REM**********ARRAYS**********
2001 tables%=0
2005 REPEAT DIMdummy% 0:UNTILdummy%MOD256=255
2010 DIM tables% (noofables%-1)*256
2020 DIM name$(noofables%-1)
2030 DIM tyPe%(noofables%-1)
2040 DIM store(255)
2050 DIM sin(255)
3000 REM**********INITIAL VALUES*******
3020 tune%=0:tyPe%(0)=tunetP%:name$(0)="firsttune"
3030 sound%=0
3040 tyPe%(1)=freQuencybP%:name$(1)="firstfreq"
3050 tyPe%(2)=enveloPetP%:name$(2)="firstenv"
3060 tyPe%(3)=controltP%:name$(3)="firstcont"
3070 tyPe%(4)=wavetP%:name$(4)="firstwave"
3080 tyPe%(5)=usedtP%:name$(5)="."
3090 FORx%=6TOnoofables%-1:tyPe%(x%)=emPtybP%:name$(x%)="":NEXTx%
3095 FORcurrent%=0TO5:PROCclear:NEXTcurrent%
3100 disPlay$="TIME"
3105 current%=1
3200 PROCnewsound
3220 FORx%=6%256TO(noofables%-1)*256-1:tables%?x%=0:NEXTx%
3230 FORx%=0TO255
3240   sin(x%)=SIN(x%*2*PI/256)
3250   store(x%)=0
3260   NEXTx%
3270 storecontents%=4
4910 PROCscreen
5000 REM**********MAIN PROGRAM**********
5005 ON ERROR GOTO5000
5010 REPEAT
5012   PROCdisPlaystatus
5015   PROCinPutfield
5020   INPUTi$
5030   IFi$="TABLE"THEN PROCtable
5040   IFi$="PITCH"THEN PROCPitch
5050   IFi$="DURATION"THEN PROCduration
5060   IFi$="NEXT"THEN PROCnext
5070   IFi$="LAST"THEN PROClast
5080   IFi$="DELETE"THEN PROCdelete
5090   IFi$="INSERT"THEN PROCinsert
5100   IFi$="CLEAR"THEN PROCclear
5110   IFi$="RENAME"THEN PROCrename
5120   IFi$="HARMONIC"THEN PROCharmonic
5130   IFi$="SEGMENT"THEN PROCse9ment
5140   IFi$="PLAY"THEN ?&81=tune%:N%=tables%:CALL M%:PRINT"PLAYED"
5160   IFi$="QUIT"THENEND
5500   UNTILO
10000 REM**********MAIN PROCEDURES*****
10010 DEFPROCtable
10020 PROClistall
10030 PROCinPutfield
10040 REPEAT
10050   PRINT"Which table (0 to ";noofables%-1;")";
10060   INPUTi%
10070   invalid%=i%<0 OR i%>noofables%-1
10080   UNTIL NOTinvalid%
10090 IFtyPe%(i%)=usedtP% THEN PRINT"Table already used":ENDPROC
10100 IFtyPe%(i%)=emPtybP% THEN PROCnewtable
10110 IFtyPe%(i%)=tunetP% THEN sound%=0:tune%=i%:IF?FNParam(freQuencybP%)=0THENP
ROCnewtune:ENDPROC ELSE IFtyPe%(i%)=tunetP% THEN ENDPROC
10120 IFtyPe%(i%)=wavetP% THEN REPEAT:INPUT"TIME or SPECTRUM disPlay (T or S)";i
$:UNTILLEFT$(i$,1)="T" OR LEFT$(i$,1)="S":disPlay$=i$ ELSE ?FNParam(tyPe%(i%))=i
%
10130 current%=i%
10140 PROCdisPlaytable
10150 ENDPROC
10300 DEFPROCPitch
10310 PROCinPutfield
10320 REPEAT
10330   PRINT"What value (";minPitch%;" to ";maxPitch%;")";
10340   INPUTi%
10350   UNTILi%>=minPitch% AND i%<=maxPitch%
10360 ?FNParam(Pitch%)=i%*.763+.5:?FNParam(Pitch%+1)=(i%*.763+.5)/256
10370 ENDPROC
10500 DEFPROCduration
10510 PROCinPutfield
10520 REPEAT
10530   PRINT"What value (";mindur%;" to ";maxdur%;")";
10540   INPUTi%
10550   UNTILi%>=mindur% AND i%<=maxdur%
10560 ?FNParam(dur%)=i%
10570 ENDPROC
10700 DEFPROCnext
10710 IFsound%=lastsound% THEN PRINT"No room left":ENDPROC
10720 sound%=sound%+1
10730 IF?FNParam(freQuencybP%)=0 THEN PROCnewsound
10750 ENDPROC
10800 DEFPROClast
10810 IFsound%=0 THEN ENDPROC
10820 sound%=sound%-1
10830 ENDPROC
10900 DEFPROCdelete
10910 IFsound%=lastsound%THENPROCnewsound:ENDPROC
10920 FORx%=sound% TO lastsound%-1
10930   FORy%=0 TO noofParams%-1
10940     ?FNbyte(tune%,x%,y%)=?FNbyte(tune%,x%,y%+noofParams%)
10950     NEXTy%
10960   NEXTx%
10970 PROCclearsound(lastsound%)
10975 IF?FNParam(freQuencybP%)=0 THEN PROCnewsound
10980 current%=?FNParam(tyPe%(current%))
10990 ENDPROC
11100 DEFPROCinsert
11110 IF?FNbyte(tune%,lastsound%,freQuencybP%)<>0 THEN PRINT"No room":ENDPROC
11120 FORx%=lastsound%TO sound%STEP-1
11130   FORy%=0 TO noofParams%-1
11140     ?FNbyte(tune%,x%,y%)=?FNbyte(tune%,x%,y%-noofParams%)
11150     NEXTy%
11160   NEXTx%
11170 PROCnewsound
11180 current%=?FNParam(tyPe%(current%))
11190 ENDPROC
11300 DEFPROCclear
11310 k%=tyPe%(current%)
11315 IFk%=tunetP%THEN PROCnewtune
11320 IFk%=freQuencybP% THEN PROCset(&80)
11330 IFk%=enveloPetP% THEN PROCset(0)
11340 IFk%=controltP% THEN PROCset(4)
11350 IFk%=wavetP% THEN PROCset(&80):current%=current%+1:PROCset(0):current%=cur
rent%-1:FORx%=0TO255:store(x%)=0:NEXTx%
11355 IFk%=emPtybP% THEN PROCset(0)
11360 ENDPROC
11500 DEFPROCrename
11510 REPEAT
11520   INPUT"Do you want to rename the tune (Y or N) ",i$
11530   UNTILLEFT$(i$,1)="Y" OR LEFT$(i$,1)="N"
11540 REPEAT
11550   INPUT"New name (not more than 8 chars) ",J$
11560   UNTILLEN(J$)<=8
11570 IF LEFT$(i$,1)="Y" THEN name$(tune%)=J$ ELSE name$(current%)=J$
11580 PROCdisPlaystatus
11590 ENDPROC
11700 DEFPROCharmonic
11710 IFtyPe%(current%)<>wavetP% THENPRINT"Waveform not selected":ENDPROC
11720 PROCinPutfield
11730 REPEAT
11740   PRINT"Which harmonic (1 to ";noofharmonics%;", or 0 for noise) ";
11750   INPUTi%
11760   UNTILi%>=0 AND i%<=noofharmonics%
11770 PRINT"Strength of comPonent ";i%;" is ";!FNelem(256+i%*4)
11780 INPUT"New strength (integer)",J%
11790 IFstorecontents%=current% THEN PROCchangeharmonic:ENDPROC
11795 storecontents%=current%
11800 !FNelem(256+i%*4)=J%
11810 FORx%=0TO255:store(x%)=0:NEXTx%
11820 FORy%=1TOnoofharmonics%
11830   strength%=!FNelem(256+y%*4)
11840   FORx%=0TO255
11850     store(x%)=store(x%)+strength%*sin(x%*y%MOD256)
11860     NEXTx%
11870   NEXTy%
11875 x%=RND(-1):FORx%=0TO255:store(x%)=store(x%)+strength%*(RND(1)*2-1):NEXTx%
11880 PROCchangewave
11885 PROCdisPlaytable
11890 ENDPROC
11900 DEFPROCse9ment
11910 IFtyPe%(current%)>controltP%THENPRINT"InaPProPriate command":ENDPROC
11920 PROCinPutfield
11930 REPEAT
11940   INPUT"Start Position (0 to 255)",i%
11950   UNTILi%>=0ANDi%<=255
11960 PRINT"Value at ";i%;" is ";?FNelem(i%)
11970 IFtyPe%(current%)<>controltP%THENREPEAT INPUT"New value (0 to 255)",J%:UNT
IL J%>=0ANDJ%<=255
11980 IFtyPe%(current%)=controltP%THENPROClistall:PROCinPutfield:REPEAT PRINT"Ne
w value (0 to ";noofables%-1;")":INPUTJ%:UNTILJ%>=0ANDJ%<=noofables%-1ANDtyPe
%(J%)=wavetP%:PROCdisPlaytable:PROCinPutfield
12000 REPEAT
12000   PRINT"End Position (";i%+1;" to 255)";
12010   INPUTk%
12020   UNTILk%>=i%+1ANDk%<=255
```

continued on page 238

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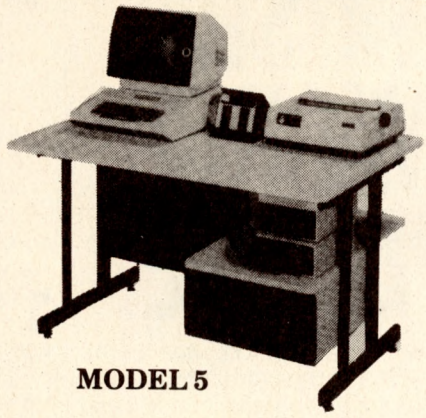
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strengths of harmonics change as the note sounds. For the moment we won't worry too much about this and will use one waveform for the whole of our tone. Later, we can define different waveforms for (say) the beginning of the note.

The harmonic amplitudes chosen will correspond to the peak amplitudes of the harmonics. They are given in Fig 3.

Firstly select spectrum display of the waveform 'firstwave' using the TABLE (<fo>) command. RENAME the table "violin.w". Now use the HARMONIC (<f1>) command to specify the harmonic strengths in any convenient order. If a mistake is made simply use the HARMONIC command to change the strength. After 15 harmonics have been specified the display should be as shown in Fig 5a. Check the time display by using the TABLE command again selecting "violin.w" and time display. The waveform should appear as shown in Fig 5b.

Now set up the envelope for the violin. Select 'firstenv' with the TABLE command and RENAME it 'violin.e'. As we want a fairly smooth envelope we will use some trigonometric functions as modulation equations rather than use simple straight lines with the SEGMENT command. Try a segment from 0 to 50 with start and end values of 0, and a modulation equation of

255 * SIN(2 * PI * x% /200)

To produce a natural decay define another segment from 50 to 230 with start and end values of 0 and a modulation equation of

255 * EXP((50 − x%) / 100).

Finish the envelope with a segment from 230 to 255 with a start value of 42, an end value of 0 and a modulation equation of 0.

Last of all we will try adding a bit of *vibrato*. Select "firstfreq" and RENAME it "violin.f". Add a segment from 0 to 255 with start and end values of 128 and a modulation equation of

5 * SIN(2 * PI * x% / 10).

Select 'firstcont' and RENAME it 'violin.c'. Set the PITCH (<f7>) to 220, (there is no need to change the duration which will still be 0 since this gives 256 units, the longest duration). Now PLAY the note (<f9>) and hear the result.

Conclusions

The BBC computer-based system described produces good quality sound digitally synthesised. A small amount of extra hardware enables the full power of the microprocessor to be used to produce sound. Most of the important parameters characterising a sound — harmonic content, volume and frequency — can be changed while the note is sounding. In theory, the quality of sound should be comparable with professional computer music synthesisers although such systems produce many channels rather than the single channel of the micro system.

Using the system is not too difficult and a very wide range of sounds can be produced. Information is available to synthesise accurately orchestral instruments as well as completely new sounds. **END**

Listing 3. SYN.BAS program (continued)

```
12030 IFtyPe%(current%)=controltP%THEN FORx%=i%TOk%:?FNelem(x%)=j%:NEXTx%:PROCdi
sPlaytable:ENDPROC
12040 PRINT"Value at ";k%;" is ";?FNelem(k%)
12050 REPEAT
12060   INPUT"New value (0 to 255)",i%
12070   UNTIL i%>=0AND i%<=255
12075 INPUT"Modulation equation ",i$
12080 FORx%=i%TOk%:?FNelem(x%)=j%+(x%-i%)*(i%-j%)/(k%-i%)+EVAL i$:NEXTx%
12090 PROCdisPlaytable
12100 ENDPROC
20000 REM**********SUPPORT PROCEDURES***
20010 DEFFNParam(Param%)=FNbyte(tune%,sound%,Param%)
20020 DEFFNbyte(tune%,sound%,Param%)=tables%+256*tune%+noofParams%*sound%+Param%
20030 DEFFNelem(elemno%)=elemno%+256*current%+tables%
20040 DEFPROCnewsound
20050 ?FNParam(freQuencytP%)=1
20060 ?FNParam(enveloPetP%)=2
20070 !FNParam(controltP%)=3
20080 ?FNParam(Pitch%)=130
20100 ENDPROC
20300 DEFPROClistall
20310 PROCtitle("Tables Available")
20320 PROCmainfield
20330 FORx%=0 TO nooftables%-1STEP2
20335   PRINTx%;name$(x%),FNtyPe(tyPe%(x%)),;
20340   IFx%()nooftables%-1THENPRINTx%+1;name$(x%+1),FNtyPe(tyPe%(x%+1))
20350   NEXTx%
20360 ENDPROC
20500 DEFFNtyPe(x%)
20510 IFx%=0THEN="freQuency"
20520 IFx%=1THEN="enveloPe"
20530 IFx%=2THEN="control"
20540 IFx%=3THEN="waveform"
20550 IFx%=4THEN="tune"
20560 IFx%=5THEN="used"
20570 IFx%=6THEN="emPty"
20580 =""
20700 DEFPROCnewtable
20710 PROCinPutfield
20720 REPEAT
20730   PRINT"New table: tyPe (0=freQuency,1=enveloPe"
20740   INPUT"2=control,3=waveform,4=tune",i%
20750   UNTIL i% (=4 AND i%>=0
20755 IFi%=wavetP%AND1%=nooftables%-1THENPRINT"No room":i%=current%:ENDPROC
20760 REPEAT
20770   INPUT"New name (not more than 8 chars) ",i$
20780   UNTIL LEN(i$)<=8
20790 name$(i%)=i$
20800 tyPe%(i%)=j%
20810 IF tyPe%(i%)<>tunetP% THEN current%=i%:PROCclear ELSE tune%=i%:sound%=0:PR
OCnewtune
20820 IFtyPe%(i%)=wavetP%THENname$(i%+1)="."+tyPe%(i%+1)=usedtP%
20830 ENDPROC
21300 DEFPROCnewtune
21305 sound%=0
21310 FORx%=0TO255
21320   ?FNbyte(tune%,0,x%)=0
21330   NEXTx%
21335 PROCnewsound
21340 ENDPROC
21500 DEFPROCdisPlaystatus
21510 PROCtablefield
21520 PRINTname$(?FNparam(freQuencytP%))name$(?FNparam(enveloPetP%))name$(?FN
param(controltP%))TAB(30)name$(tune%);
21530 PROCparafield
21540 PRINT"Sound: ";sound%;"  Pitch: ";(?FNparam(Pitch%)+256*?FNparam(Pitch%+1
))*1.31;"  Duration: ";?FNparam(dur%);
21550 ENDPROC
21700 DEFPROCset(value%)
21710 FORx%=0TO255
21720   ?FNelem(x%)=value%
21730   NEXTx%
21740 ENDPROC
21900 DEFPROCclearsound(sound%)
21910 FORx%=0TOnoofParams%-1
21920   ?FNParam(x%)=0
21930   NEXTx%
21940 ENDPROC
22100 DEFPROCdisPlaytable
22110 IFtyPe%(current%))wavetP%THEN ENDPROC
22120 PROCtitle(name$(current%))
22130 PROCmainfield
22140 MOVE48,944:DRAW48,304:DRAW1200,304
22150 IFtyPe%(current%)=wavetP%THEN PROCdisPlaywave:ENDPROC
22160 IFtyPe%(current%)=controltP%THEN PROCdisPlaycontrol:ENDPROC
22170   FORx%=0TO255STEP10:MOVE32,304+x%*640/256:DRAW40,304+x%*640/256:NEXTx%
22180 FORx%=0TO255STEP100:MOVE32,304+x%*640/256:DRAW48,304+x%*640/256:NEXTx%
22190 PROCxscale
22200 MOVE64,304+?FNelem(0)*640/256:FORx%=0TO255:DRAWE64+x%*1120/256,304+?FNelem(
x%)*640/256:NEXTx%
22210 ENDPROC
22500 DEFPROCxscale
22510 FORx%=0TO255STEP10:MOVE64+x%*1120/256,288:DRAW64+x%*1120/256,296:NEXTx%
22520 FORx%=0TO255STEP100:MOVE64+x%*1120/256,288:DRAW64+x%*1120/256,304:NEXTx%
22530 PRINTTAB(0,21);"  0     50    100    150    200    250";
22540 ENDPROC
22700 DEFPROCdisPlaywave
22710 IF LEFT$(disPlay$,1)="T" THEN MOVE64,304+?FNelem(0)*640/256:FORx%=0TO255:D
RAW64+x%*1120/256,304+?FNelem(x%)*640/256:NEXTx%:ENDPROC
22720 PRINTTAB(0,21);"  N 1   3   5   7   9   11  13   15";
22730 y%=0
22740 FORx%=0TOnoofharmonics%
22750   IFy%<!FNelem(x%*4+256)THEN y%=!FNelem(x%*4+256)
22760   NEXTx%
22770 IFy%=0THEN ENDPROC
22780 FORx%=0TOnoofharmonics%
22790   MOVE64+x%*1120/noofharmonics%,304:DRAW64+x%*1120/noofharmonics%,304+!FNe
lem(x%*4+256)*640/y%
22800   NEXTx%
22810 ENDPROC
22900 DEFPROCdisPlaycontrol
22910 FORx%=38TO0STEP-2
22912   IFx%(nooftables%THENPRINTx%MOD10 ELSEPRINT
22914   NEXTx%
22920 PROCxscale
22930 MOVE64,336+?FNelem(0)*16:FORx%=0TO255:DRAW64+x%*1120/256,336+?FNelem(x%)*1
6:NEXTx%
22940 ENDPROC
23100 DEFPROCchan9eharmonic
23110 stren9th=j%-!FNelem(256+i%*4)
23120 !FNelem(256+i%*4)=j%
23125 IFi%=0 THEN x%=RND(-1):FORx%=0TO255:store(x%)=store(x%)+stren9th*(RND(1)*2
-1):NEXTx%
23130 IFi%<>0 THEN FORx%=0TO255:store(x%)=store(x%)+stren9th*sin(x%*i%MOD256):NE
XTx%
23140 PROCchan9ewave
23145 PROCdisPlaytable
23150 ENDPROC
23200 DEFPROCchan9ewave
23210 max=0
23220 FORx%=0TO255
23230   IFABS(store(x%))>max THEN max=ABS(store(x%))
23240   NEXTx%
23250 FORx%=0TO255
23260   ?FNelem(x%)=store(x%)*127/max+128
23270   NEXTx%
23280 ENDPROC
30000 REM**GRAPHICS SUPPORT ROUTINES***
30010 DEFPROCtitle(a$)
30020 VDU28,0,0,39,0
30030 CLS
30040 PRINTTAB(20-LEN(a$)/2);a$;
30050 ENDPROC
30200 DEFPROCmainfield
30210 VDU28,0,23,39,2
30220 CLS
30230 ENDPROC
30400 DEFPROCinPutfield
30410 VDU28,0,31,39,30
30420 CLS
30430 ENDPROC
30600 DEFPROCtablefield
30610 VDU28,0,26,39,26
30620 CLS
30630 ENDPROC
30800 DEFPROCparafield
30810 VDU28,0,28,39,28
30820 CLS
30830 ENDPROC
31000 DEFPROCscreen
31010 CLS
31040 MOVE 0,976:DRAW 1279,976
31050 MOVE0,240:DRAW1279,240
31060 MOVE0,144:DRAW1279,144
31070 MOVE0,80:DRAW1279,80
31080 PRINTTAB(17,24)"TABLES"
31090 PRINT"FREQUENCY ENVELOPE  CONTROL   TUNE"
31100 ENDPROC
```

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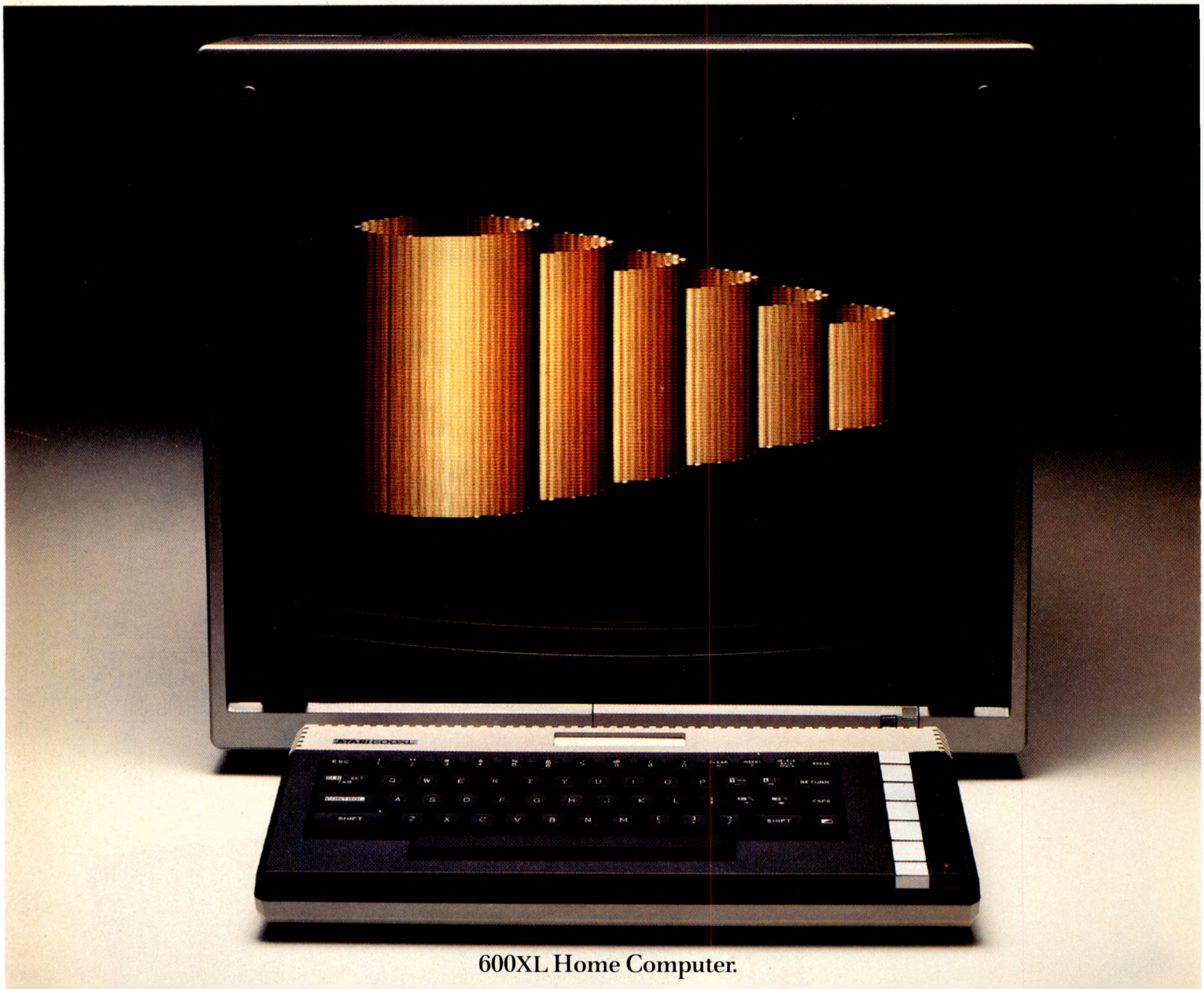
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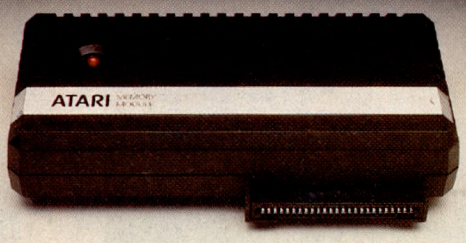
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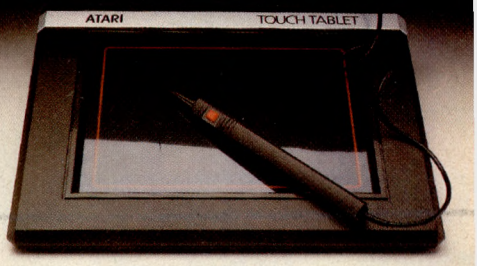
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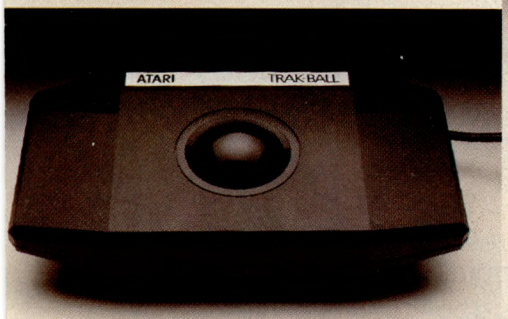
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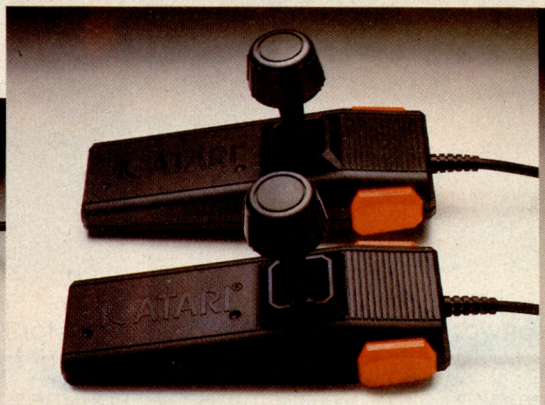
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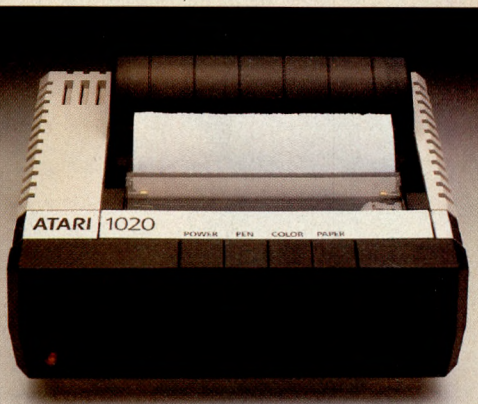
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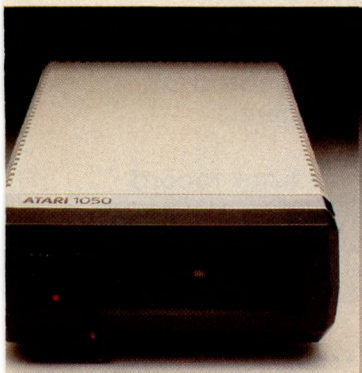
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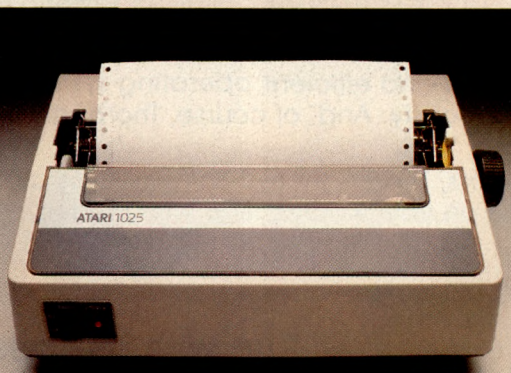
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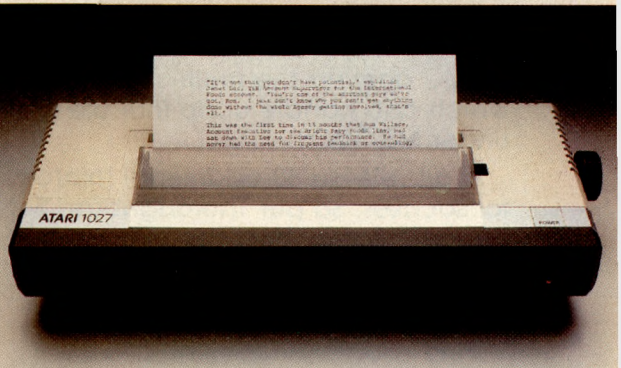
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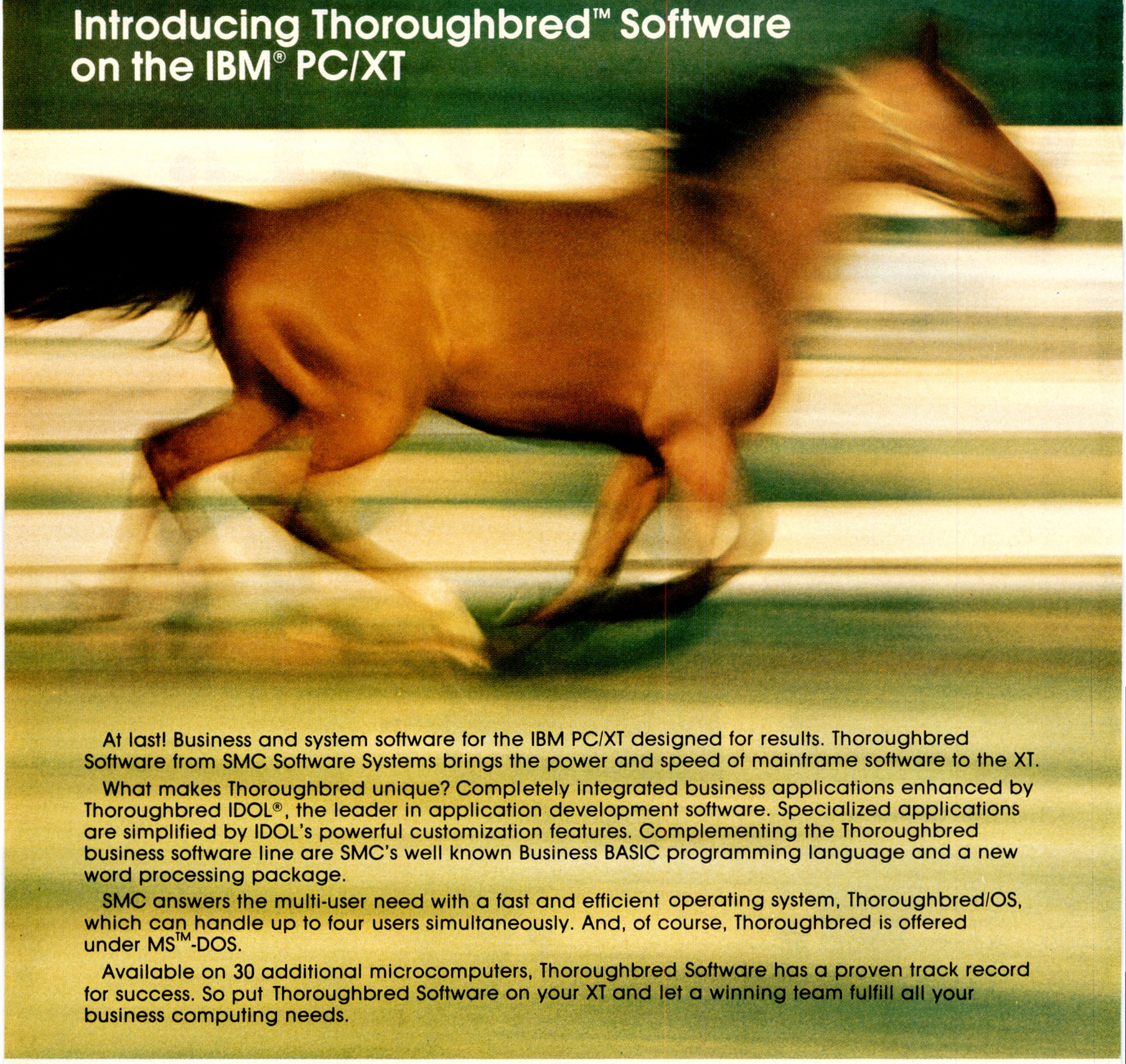
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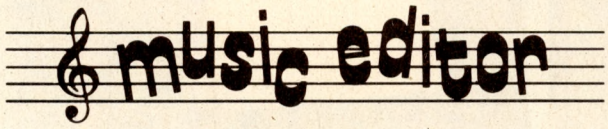
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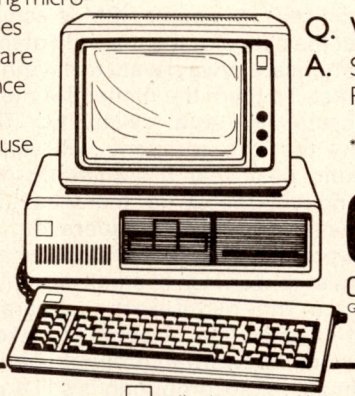
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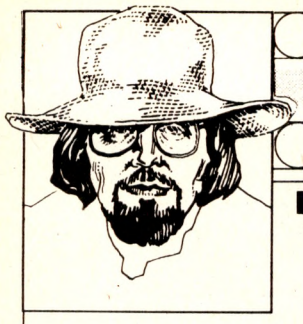
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The Party's Over...

The spirit of '1984' is closer than ever with IBM looming ominously over the computer industry. Martin Banks reminisces.

Sometimes, in the wee small hours of the morning when I lie abed betwixt consciousness and the oblivion of sleep, I get these strange nostalgic feelings come over me. I think back to the good old days, days when men were men and personal computers were personal computers, and then I start to wonder where it all went wrong.

In those early days of Altair and Imsai, when the Apple was but a seedling in the minds of Wozniak and Jobs, personal computers were called that because they were small enough to be carried by one person — just. They didn't do too much, and broke down a good deal; they had to be hand-booted with toggle switches and just adored the feel of a hot soldering iron inside them.

One person and a soldering iron could become a computer company almost over night, and many did as they discovered that there were enough nutty people out there willing to help them turn a hobby into a business. Many of them, the aforesaid Wozniak and Jobs being no exception, grew to become extremely successful and weathy as their businesses grew and refused to fall over in the financial mire that many predicted for them.

This, of course, was their downfall. Their very success, proving that there was a long-term market for personal computers of many different types, ultimately attracted the interest of more old-fashioned computer people. These elders had, up until that time, assumed a divine right to the computer industry and markets, yet the little upstarts had shown it was not so. Something had to be done.

Not unnaturally, these 'other people' decided to do it. Thus it was that IBM, the jolly blue giant of Armonk, decided to launch the IBM PC. At that point in time, personal computing, and the industry it had spawned, stopped being fun. It became a business, a big business, and unfortunately, a boring business. It's always the same of course, when something stops being fun anymore.

It may be an over-simplistic view, but the arrival of IBM on the scene has been a major contributor to the arrival of the long-expected shake-out in the personal computer business. By the time the shake-out has finished, the number of companies still making significant quantities of computer hardware will have been drastically reduced. While you might comment 'so what?', the end result for the users is not likely to be the best thing that ever happened to them.

Why? — Well, consumer choice will become restricted to the point of constriction. Not only will there be fewer companies making machines, the difference between those machines will become increasingly negligible. For better or worse, now that IBM is in the business the others are all followers, devout and humble. Doing something different in hardware design or philosophy may well mark a company as socially deviant and therefore the target for the ultimate sanction — terminal financial ruin.

'. . . the arrival of IBM on the scene has been a major contributor to the arrival of the long-expected shake-out in the personal computer business.'

Ironically, of course, IBM is actually what the users (or the majority of them in America, anyway) want to have in the market. To them the name IBM means respectability and reliability. They know that the company will still be around next year if something goes wrong with the kit. For many business users this is a vital consideration, one that prejudices their decisions when it comes to buying a small computer system. They might like the appearance and specification of another make of machine, but will the company survive? After all, microcomputing is still a very young industry, with very young and inexperienced companies making it up; such worries are understandable for business managers looking to a long-term future (especially their own).

The end result, however, is that such caution does not easily square with a competitive market-place: something has to give. In this case it is competition that is giving, and for the end user that is sad. It will be sad to see a time when there are a dozen or so makes of computer on the world market, and each one a clone of the products of that one big company, IBM.

If the machine had been produced by any other manufacturer it would have been taken on its merits, praised where needed, abused where required and that would have been an end to it. Many companies have produced systems just as sensible and 'worthy' as the IBM PC. They have (or have not) found their niche in the market-place, served their users more or less as expected and that has been an end to the matter. Now there is the matter of the little silver badge on the little cream box. IBM is in the business and all the manufacturers are scared. Even the mighty Apple, for all its standing in the industry, has felt the ground shaken beneath its feet.

If IBM had made Apple's Lisa it would not only have been hailed as a product, it would also have taken the business apart. But it didn't and Apple is now beginning to feel the predictable chill of falling profits that comes from a market where leadership has been lost.

And now IBM is turning its sights onto new markets, other areas of the computer business in which some companies are doing well and which the jolly blue giant has not previously bothered about. The target is the home/personal computer market, until now the chief stamping ground of Commodore and Sinclair.

It will be interesting to see how it survives in this particular nest of vipers, for some other big names (which one assumes generally know what they are doing) have been bitten hard, long and painfully. Some, notably Texas Instruments and Mattel, have decided on amputation rather than let the poison spread and become terminal.

For other, smaller companies, there has been nothing available to amputate. This has started to result in plenty of ritual disembowelments.

It will also be interesting to see whether IBM can repeat its initial success in the small business market down at the home/personal level. It has already shown itself an exception to the maxim that you can't teach an old dog new tricks, but whether it can learn

STATEMENT



Illustration by Tony Hannaford

another set of new ones remains to be seen. The Commodore, for example, has shown that the product does not have to be that sensational or sexy. An ordinary little computer will do, just make sure it has some software available then pile it high and sell it aggressively.

From early indications, IBM would seem to have once again learned the first part of this trick. The PC Junior(*née* Peanut) appears to be a not drastically exciting cut-down of the PC with one or two novelties thrown in (the infra-red remote keyboard sounds a smart idea). It remains to be seen whether the company will learn how to sell the beasts in the necessary manner. It is not averse to a bit of cut-throat commercialism, but IBM has never sullied into the consumer market-place before, and consumers are a funny bunch, aren't they!!

Next year, therefore, could be the one in which all interest finally disappears from the computer market — when it stops even remotely being 'fun'. IBM will take over everything remotely digital in nature and will become rich enough to buy India as a holiday resort for jaded executives. On the other hand . . .

END

A CLOSE ENCOUNTER OF THE ATARI KIND

You can learn about yourself with this music synthesiser/light-show version of SIMON for the Atari by Tim Banse.

Have you ever watched kids and grown-ups at the video arcade pouring an oil sheik's ransom in ten penny pieces into a game of intergalactic conquest? Besides passing time and building hand-eye coordination, the gamers are flexing an advantage unavailable to yesteryear's Neanderthal hunter-warrior kind. With these readily accessible new-fangled micros comes a new way of thinking, seeing and communicating with the universe. And although at first glance the 'R is for Red' game offered here may appear similar to a well-known chain store home entertainment device, close scrutiny reveals several dimensions that run deeper than any party game.

One of the discovered jewels in this dawn of the Age of High Technology has been researchers' realisation that different hemispheres of the brain click in or out while performing different tasks. The brain can operate in two different dimensions in deciphering this light and sound cryptogram. First is the conscious level where you can remember: 'Let's see, I saw a blue bar, two greens and then a red.' But probably more important is the unconscious, or Zen, part: the Force part where the participant doesn't think about the tennis, jogging or computer game strategy. He simply reacts without thinking, as many of us do.

In 'R is for Red', the colour and music sequence is not remembered for its individual sights and sounds, but rather is recalled as an entire block or 'word' made up of colours. The colour bars are like an alphabet — words are spelt out, not with A to Z characters, but with patterns of blues, reds, greens and yellows. As the colours flash on to the screen you don't dissect the pattern letter by letter, but speed-read it as a word, phrase and sentence.

Doesn't it sound fascinating? The concept becomes intriguing when you recall the film *Close Encounters of the Third Kind,* in which an international team of scientists assemble at Devil's Tower to set up a music synthesiser/light-show to communicate with aliens. They communicate with blocks of colour and sound in a high-tech, computer-driven Esperanto. How many colours can your eye and brain distinguish? Six or seven at one time is about average, but with practice the galaxy is the limit.

One of the more sophisticated software aspects of this colour cryptogram is how it uses the player missile graphics. While no animation is used, the program does exploit some of the unique qualities of the Atari personal computer, such as its speed. Instead of having to draw, undraw and then draw again every time the program needs to flash a colour on the screen, the Atari uses the player-missile graphics. The first step is to draw the bars from top to bottom, one at a time, from left to right. Since no colour for the bars is specified they are automatically assigned the default black.

All four players are displayed on the screen, side by side, waiting for the routine that will call each to life when its appropriate colour register is POKEd: it remains painted for as long as the skill level delay loop lets it. The bar is then faded to black and the next appropriate colour bar comes out of hiding.

With the Atari, each player has an individual size register that controls its width. For experimentation's sake, POKE the number 3 instead of the number 1 with each of the four registers assigned to statement number 1280. Run the program. Each player will have quadrupled in width and each will be overlapping the others. The display will now be quite ugly. For an aesthetic remedy, change the horizontal locations of each of the layers in lines 1300 and 1310. Replace the values of 90,110,130 and 150 with 50,90,130 and

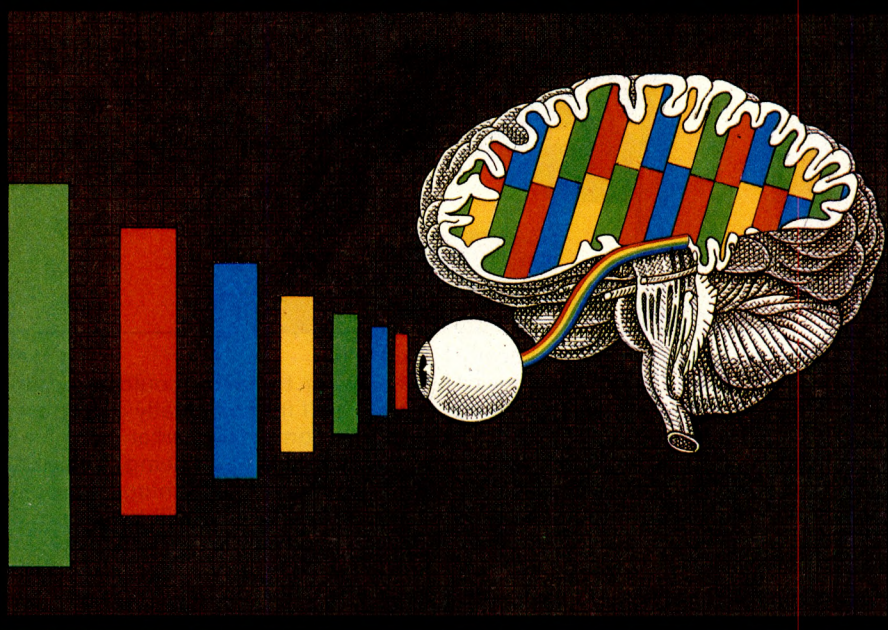


Illustration by Robin MacFarlan



170, respectively. Next time you run the program it will look much prettier.

To play the game, wait while the player/missile graphics are initialising. Read, filling that area of RAM with zeros to clear it and then actually drawing the colour bars. A message will then flash on the screen saying SKILL LEVEL (1-5). At that point, hit any number from 1 to 5, with 1 being the slowest and easiest routine and 5 being the fastest, toughest and most interesting.

As the program puts you through its paces, it will flash a colour bar on the screen, the colour accompanied by its own musical note. When you see a blue bar, hit the letter B. Just touch the key — you won't need to hit return: R is for red; B is for blue; and Y is for yellow. When you respond with the correct key for the correct colour, another colour/musical note will be added to the sequence.

Line 110 clears the screen. The poke 84 modifies the print command so that it stays within the range of the graphics 2 mode, preventing an error message.

Line 120 directs the program to the player/missile graphics sequence. Lines 1180 through 1260 draw the vertical bars 70 bits tall by eight bits wide and paint them black, by default. Line 1280 sets the player at single width, which translates into eight bits across. Lines 1300 through 1310 place the boxes at their horizontal positions. Line 1330 gives the final signal to turn on the graphics.

Meanwhile, back at the top of the program: line 170 prints the skill level message and the micro waits at line 200 for the choice. When a key from 1 to 5 is typed, that key's ASCII code is compared to the table in lines 230-270. The appropriate skill value will be placed in the delay loop that determines how long the colour bars will be on-screen. Line 290 routes you to the beginning of the main program.

Line 640 picks a random number, any number between 1 and 4. That number is given a number. The first number will be between 1 and 4 and will tell the program which of the four colours (red, blue, green or yellow) to display. The second number, which keeps track of each colour in the sequence, is assigned in each turn by line 690. Once a colour is chosen, and having told the computer where it is in the sequence, the program jumps to line 300.

Lines 300-410 hold the program loop where all the colours in the sequence so far are flashed on the screen. You will see all the previous colours you have remembered and keyed correctly, plus one addition to the pattern.

Lines 470-600 will test your memory of the sequence.

As each colour comes up on its turn, lines 320-410 will send the program to the subroutine which paints that colour. There are four such subroutines: lines 720-770, 780-830, 840-890 and 900-950. On reaching one of these subroutines, the program will paint the bar either red, blue, green or yellow. Then comes the musical note. Colour and note are delayed for as long as was specified in the skill level. After the delay is satisfied, the sound is killed and the bar is painted black, then it's back to the main loop for the next colour bar.

The loop knows how many colours were flashed on the screen and will wait for that many keystrokes. Each keystroke will be matched against the proper sequence. If you enter a colour out of sequence, the program lumbers off to the 'blunder' routine to let you know you aren't as quick or as smart as you once were.

The blunder routine, lines 1000 through 1070, shuts off the keyboard, plays a sour note, clears the value of all variables to zero and starts the game over.

However, if you haven't yet goofed, the game will continue randomly adding colour bars to the sequence.

One thought — why not close both eyes and play by ear? Can you recall the sequence of musical notes? How about manual dexterity? Where is that R? Here's where you try out the computer Zen I mentioned earlier, remembering what you 'saw' with your mind's eye, reaching out with that inner sanctum of grey matter that we little understand and so much crave to master.

END

Tim Banse is author of Home Applications for the Atari Personal Computer *published in the USA by Computer Science, August 1983.*

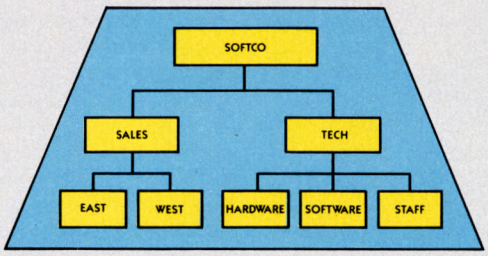
```
100 REM "R" IS FOR RED GAME
110 ? CHR$(125):REM CLEAR SCREEN
120 GOSUB 1000:REM GO DRAW COLOR BARS
130 DIM TURN(255),SKILL(3),NUMBER(255)
140 REM LOCATE CURSOR
150 POSITION 2,10
160 REM CHOOSE SKILL LEVEL
170 ? #6;"SKILL LEVEL  (1-5)"
180 REM READ KEYBOARD
190 OPEN #1,12,0,"K"
200 GET #1,SKILL
210 CLOSE #1
220 REM SET SPEED OF DISPLAY
230 IF SKILL=49 THEN SKILL=150
240 IF SKILL=50 THEN SKILL=100
250 IF SKILL=51 THEN SKILL=50
260 IF SKILL=52 THEN SKILL=25
270 IF SKILL=53 THEN SKILL=10
280 REM GET FIRST COLOUR
290 GOTO 640
300 COUNT=0:REM RESET COUNTER
310 REM LOOP TO DO EACH COLOUR
320 FOR I=1 TO NUMBER
330 REM DISPLAY EACH COLOR
340 IF TURN(COUNT)=0 THEN GOSUB 720
350 IF TURN(COUNT)=1 THEN GOSUB 780
360 IF TURN(COUNT)=2 THEN GOSUB 840
370 IF TURN(COUNT)=3 THEN GOSUB 900
380 REM INCREMENT EACH TIME
390 COUNT=COUNT+1
400 REM DO NEXT COLOR
410 NEXT I
420 REM OPEN KEYBOARD  FOR READ
430 OPEN #1,4,0,"K:"
440 COUNT=0
450 REM FIRST TIME THROUGH IS 1
460 IF NUMBER<1 THEN NUMBER=1
470 FOR K=1 TO NUMBER
480 REM READ KEYBOARD
490 GET #1,RESPONSE
500 REM KEEP TRACK OF TIMES THROUGH
510 LET ANSWER=TURN(COUNT)
520 REM TRANSLATE ANSWER
530 IF ANSWER=0 THEN ANSWER=82
540 IF ANSWER=1 THEN ANSWER=66
550 IF ANSWER=2 THEN ANSWER=71
560 IF ANSWER=3 THEN ANSWER=89
570 REM MATCH PATTERN AGAINST PLAYER RESPONSE
580 IF RESPONSE<>ANSWER THEN 970
590 COUNT=COUNT+1
600 NEXT K
610 CLOSE #1
620 NUMBER=NUMBER+1
630 REM CHOOSE RANDOM COLOUR
640 LET COLOR=INT(4*RND(1))
650 REM SAVE COUNT IN NUMBER
660 LET COUNT=NUMBER
670 IF COUNT=0 THEN COUNT=1
680 REM LABLE EACH COLOR IN SEQUENCE
690 LET TURN(COUNT)=COLOR
700 REM DO AGAIN
710 GOTO 300
720 POKE 704,48:REM COLOR RED
730 REM MAKE SOUND
740 SOUND 1,50,10,8:FOR J=1 TO SKILL:NEXT J
750 SOUND 1,0,0,0:REM KILL SOUND
760 POKE 704,0:REM COLOR BLACK
770 RETURN
780 POKE 705,128:REM COLOR BLUE
790 REM MAKE SOUND
800 SOUND 1,72,10,8:FOR J=1 TO SKILL:NEXT J
810 SOUND 1,0,0,0:REM KILL SOUND
820 POKE 705,0:REM COLOR BLACK
830 RETURN
840 POKE 706,192:REM COLOR GREEN
850 REM MAKE SOUND
860 SOUND 3,96,10,8:FOR J=1 TO SKILL:NEXT J
870 SOUND 3,0,0,0:REM KILL SOUND
880 POKE 706,0:REM COLOR BLACK
890 RETURN
900 POKE 707,255:REM COLOR YELLOW
910 REM MAKE SOUND
920 SOUND 3,96,10,8:FOR J=1 TO SKILL:NEXT J
930 SOUND 3,0,0,0:REM KILL SOUND
940 POKE 707,0:REM COLOR BLACK
950 RETURN
960 TRAP 960:GOTO 240
970 REM MISTAKE ROUTINE
980 CLOSE #1:REM TURN-OFF KEYBOARD
990 REM BLUNDER SOUND
1000 SOUND 1,243,10,8
1010 REM DELAY TO PLAY SOUND
1020 FOR I=1 TO 200:NEXT I
1030 REM TURN OFF SOUND
1040 SOUND 1,0,0,0
1050 REM CLEAR ALL VARIABLES TO ZERO
1060 REM THEN BEGIN AGAIN
1070 CLR :GOTO 130
1080 GRAPHICS 2+16:SETCOLOR 4,7,4
1090 REM LOCATE CURSOR
1100 POSITION 4,10
1110 REM WAIT MESSAGE WHILE DRAWING
1120 REM PLAYER/MISSILE GRAPHICS
1130 ? #6;"PLEASE WAIT"
1140 A=PEEK(106)-8:POKE 54279,A
1150 PMBASE=256*A:POKE 559,46
1160 REM CLEAR GRAPHIC MEMORY BY LOADING WITH ZEROS
1170 FOR I=PMBASE+512 TO PMBASE+1024:POKE I,0:NEXT I
1180 REM DRAW BOXES 8 BITS WIDE BY 70 BITS TALL
1190 FOR RED=PMBASE+528 TO PMBASE+598
1200 POKE RED,255:NEXT RED
1210 FOR BLUE=PMBASE+656 TO PMBASE+726
1220 POKE BLUE,255:NEXT BLUE
1230 FOR GREEN=PMBASE+784 TO PMBASE+854
1240 POKE GREEN,255:NEXT GREEN
1250 FOR YELLOW=PMBASE+912 TO PMBASE+982
1260 POKE YELLOW,255:NEXT YELLOW
1270 REM SET WIDTH OF BOXES
1280 POKE 53256,1:POKE 53257,1:POKE 53258,1:POKE 53259,1
1290 REM LOCATE BOXES HORIZ. POSITION
1300 POKE 53248,90:POKE 53249,110
1310 POKE 53250,130:POKE 53251,150
1320 REM TURN ON GRAPHICS
1330 POKE 53277,3
1340 RETURN
```

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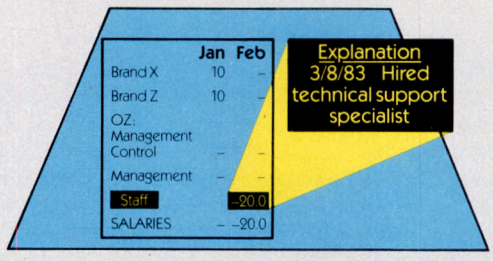
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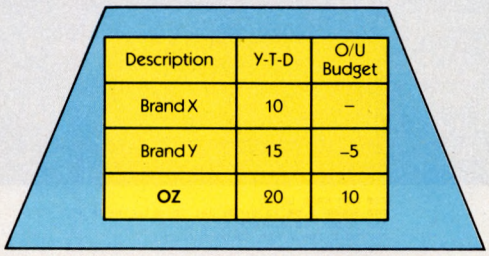
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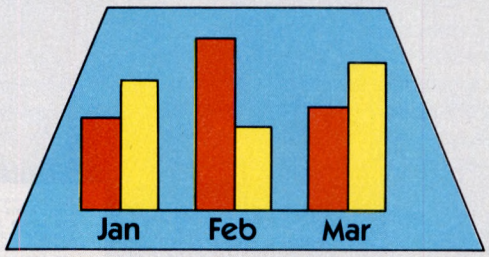
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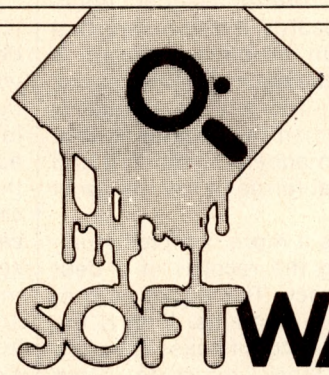
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SOFTWARE Everyman

Kathy Lang tries out a powerful and innovative British database which allows several different but interrelated sets of information to be processed together.

The great majority of the packages I've reviewed in this series have used an individual file for storing each set of records, with each record in one file having the same structure. This approach is fine if your information has a simple structure, but not so good if you need to process several different sets of information together. For instance, the application upon which my Benchtest is based involves storing information about products which may be obtainable from several different suppliers, who in turn may supply several products. I handle this in the 'single file' approach by assuming that each product will have no more than four sources, and keeping a supplier code and a price for each possible supply in the same record as the product information. Where the package permits it, I also create a separate file containing information about each supplier.

Many packages allow limited relationships of this kind among sets of data, but the basic concept is still of one or more 'flat files' with the user having to be aware all the time of the (sometimes rather tortuous) relationship between the information and the computer's representation of it. On mainframe computers, more complex data structures are commonly implemented in database management systems, using a data dictionary to keep track of the whereabouts of each item of data. These systems take various forms: an increasingly popular approach is to use the relational model, which in its purest form requires the use of techniques which aim to ensure the integrity of the data. (For instance, in the Benchtest example, it is important to make sure that information about the supply of a product does not refer to a supplier about whom we have no information.) These techniques owe much to EF Codd of IBM, with his pioneering work on storing data in 'normal forms' which help to minimise redundancy and maintain consistency. (Anyone who is interested in finding out more about the relational model might like to read *Introducing Relational Database* by Mayne and Wood, published by the NCC.)

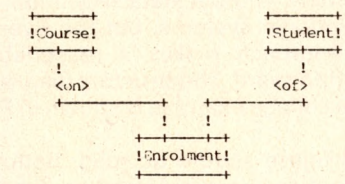


Fig 1

A number of packages on micros claim to use the relational approach, but in most cases this means no more than that they regard each 'flat file' as a table of data, with each row constituting one record. Such packages may not even require each row or record to have a unique identifier or 'key', still less attempt to enforce, or at least encourage, the storage of data in the 'normal forms'. A more sophisticated attempt to implement the relational model on micros is the subject of this month's Benchtest, Everyman, a new British package which sets out to process information which may include quite complex inter-relationships, using the relational approach.

One of the problems of implementing complex data structures on a computer lies in showing the data

What is a Database?

If you want to process information which has some form of structure (such as accounts, personnel records, job costing), you can use an off-the-shelf package which will probably not be quite what you want, and hard to adapt. Alternatively you could write a program specially, which will cost a lot in time and money and still contain errors. The third possibility is to buy a data management package. These packages allow you to store, process and report on structured information.

Most of the cheaper packages are based on a traditional card index, where each card or set of cards about one person, order or item of stock is stored in a single record, and a group of like records are stored in a file (corresponding to the index card box). Each item which would be recorded on the card — name, job title, part number, stock quantity — is stored in a field within the record. Usually, each record within one file must have the same number and size of fields — they are 'fixed length fixed format' records.

Some more sophisticated packages can relate several files together, so that you can process groups of unalike but related records. The costs range from £155 for a simple card-index-like system to nearly £1,000 for a complex package which can be used by several people at the same time.

relationships in a way which can be both understood by the designer and implemented by the computer. Everyman takes a novel and very helpful

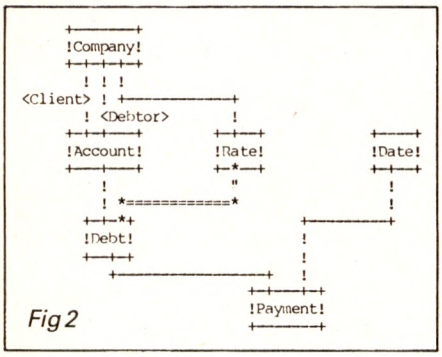


Fig 2

approach to this problem, by having as its basic unit a structure diagram which the user draws on the screen while setting up the data structures. The ability to use simple cursor movements and well thought out control sequences to set up and edit the structure is a big help in getting it right, and much preferable to using just words to express relationships between data items.

Everyman's tutorial manual uses throughout the example of a college, which wishes to keep records about students and about courses: there may be many courses each presented to several students, and each student may attend several courses. Such a 'many too many' relationship is quite hard to implement without data repetition in conventional systems, but the Everyman approach makes it reasonably straightforward. The structure diagram for the college example is shown in Fig 1.

The figure should be read 'bottom up', so that it is considered as 'Enrolment on Course' and 'Enrolment of Student'. Each box on the diagram represents a 'table' of information, in which each column represents an item of information (often called a field in other packages) and each row represents one instance of a set of items (often called a record). So while there may be many courses and many students, each enrolment represents the information about one student on one course, and while the (indirect) link

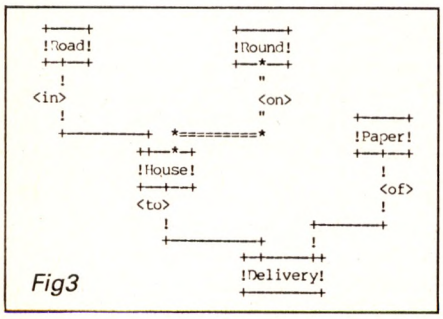


Fig3

between students and courses is 'many too many', that between enrolment and course is 'one too many'. The Enrolment box is said to be dependent upon the other two, and its relationships with them are dependent relationships. In practice, this means that you cannot set up an enrolment for a course which does not exist, nor for a student not in the student records. It also means that the key to an Enrolment record is composed of the key to a course record, together with the key to a student record. Everyman thus makes it easy and natural to adhere to the first and second normal forms of the relational model.

Fig 2 shows a more complex structure depicting the records of a debt collection agency. This structure contains two new elements. Firstly, the Company and Account boxes have two links between them. This indicates that a company may be both a client of the agency and a debtor of another client of the agency. The second new feature is the double-link link between Rate and Debt. This indicates a Reference link, as opposed to a Dependent link, and its main function is to provide access to information which is related to the main boxes but which is not essential for them to exist. So it is possible to have a Debt record for which there is no corresponding Rate record. The uses of these links are many and various: in this instance, Rate contains a table of debt amounts and corresponding rate charges, which is read and used when calculating the payment owed for collecting a debt.

To describe the package in more detail I shall use an example of a structure midway in complexity between the earlier examples, which models a newsagent's delivery system. A possible structure diagram is shown in Fig 3. The basic unit involved is a delivery of a paper to a house in a road. Each house may also be on a round, though the particular round may change from time to time as demand for papers changes: some houses are not on rounds, perhaps because the customer collects his own papers, so Round is a reference link which will not always exist.

Once the structure of an application (called a Project) is set up, you can then define the items to go in each box, how you want to view them, what calculations are to be done on them, and how information is to be reported. Direct access to information is always through the box identifier (which you can think of as the primary key), but you can base tests on other items when selecting subsets of information. Limited tailoring facilities are provided to 'tune' the approach to a particular need. Information can be imported from and exported to text files in ASCII format: this mechanism is used not only to load 'foreign' data files, but also to preserve the data in an Everyman project when you wish to change its design. In the version of Everyman I tested, importing was very slow — see the Benchmarks in Fig 4.

Constraints

Everyman is available for a variety of 16-bit systems, including Sirius and the IBM PC. Most of the limitations seem to be related to physical constraints such as available memory, rather than being program-dependent. For instance, the program restriction on the number of items in a box is so great that you would run out of memory for storing one instance of the project structure long before you reached the practical programs limit. But since items are always displayed with one line of the screen for each set of items (record), it can become tedious scrolling sideways until you find the item you need. (Everyman has a facility for 'hiding' items not currently needed in the display, but that still has to be activated.) In practice, this would be likely to impose a 'voluntary' limit on the

BM1	Time to add one new record	4secs
BM2	Time to select record by primary key	4secs
BM3	Time to select record by secondary key	NA
BM4	Time to access 20 records from 1000 sequentially	12secs/rec
BM5	Time to access record using wild code	10secs/rec
BM6	Time to index 1000 records on 3-character field	NA
BM7	Time to sort 1000 records on 5-character field	NP
BM8	Time to calculate on one field per record and store result in record	1hr 48mins*
BM9	Time to total three fields over 1000 records	2hrs 5mins* + BM0
BM10	Time to add one new field to each of 1000 records	1hr 55mins*
BM0:	Time to import a file of 1000 records:	5hrs 40mins*

Notes: *=Estimated from time for 200 records. NP=Not Possible NA=Not applicable

Fig 4 Everyman Benchmark Times

Constraints and Functions		Functions and Support	
Maximum size of whole project	Operating system file size limit	*Data validation	Good
Max record size	32767 characters	*Screen formatting	Default
Max no fields	Memory dependent	*Unique keys	Mandatory
Max field size	60 characters	*Report formatting *	Co-ordinates must be specified
Max digits	9	*Store calculated data *	Input, Editing, Batch
Max prime key length	60 characters	*Totals & Statistics	Totals+Sub–Totals
Special disk format?	No	*Store selecn criteria	Permitted
File size fixed?	Yes#	*Combining criteria	And, Or
Link to ASCII files?	Yes, fixed format	*>1 criterion/field?	Y
Data types	C,N,D,L,TS	*Wild code selection?	String Within
Fixed rec structure?	Yes	*Browsing methods	Key only
Fixed record length stored?	Yes	*Interaction methods *	Menu, Commands, Limited tailoring
Amend rec structure?	Yes#	*Reference manual+	****
Link data boxes?	Yes	*Tutorial Guide+	****
No data boxes open	Unlimited	*Reference Card+	**
No sort fields	Key order only	*On-Line Help+	***
No keys	1 per box	*Hot-line? *	Y, free for first year
Max key length	Depends on box type		
Subs'y indexes UTD?	No subs'y indexes		

Notes: NP= Not possible. NA=Not applicable. +=Max rating is 5 stars. #=Fixed within package, can be changed by copying to external file and re-loading into Everyman structure.

Fig 5 Everyman Constraints, Functions and Support

number of items in a box. However, with the structured approach this causes fewer problems than a system which obliges you to have all the items in a single record structure. The number of boxes is also limited, not by the program, but by the ingenuity with which you can arrange them, with their associated links, on a single screen. Fig 2 still has quite a bit of spare space . . .

Data types permitted are alphabetic, numeric, logical, date (in a variety of formats, all supporting proper date arithmetic) and time span in days, months or years. Items may be calculated either on input or on update in a variety of ways. The major constraints and functions are shown in Fig 5.

File creation and Indexing

The basic unit in Everyman is not a file but a project; how this is actually stored is not the user's concern. When Everyman is run, the user is presented with a menu of existing projects. You may either move the cursor onto the name of one of them and press RETURN to invoke it, or type the name of a new project which you wish to set up. At this stage, the project will have Design status, which just means that you are free to set up boxes and define items as appropriate. You must also define the maximum file size at this point. Once a project has been designed, you can give it Test status, in order to try it out with some dummy information before going ahead. Once certain that the design is complete, you give it Live status; from then on any data you enter is preserved, but the structure may not be changed. The structure of a live project may only be changed (without destroying the data) by copying it out to a 'flat format' file and reloading it, but Everyman supplies routines to do this.

Designing a project involves 'drawing' on the screen a structure diagram, and then defining the items for each box. Drawing the structure diagram is one of the best parts of Everyman; it has been really well thought out, and I found it fun. You simply put the cursor where a box is to go, type its name and press RETURN: Everyman then draws a box round it. To draw a link between one box and another, you place the cursor on the bottom of the 'superior' box, press the plus sign, and move the cursor along the path needed to draw a line into the top of the 'dependent' box. Reference relationships are set up in the same way, using a different starting symbol. During the drawing process you can delete and move boxes, redraw links and move around the screen at will, setting up further boxes, drawing links and labelling them as you go.

Once the structure has been set up, you then go round each box in turn, putting the cursor in it and pressing RETURN. This box is then displayed together with each box needed to reach it. Each item for the delivery box is then defined.

While a project is being developed, you may make as many design changes as you wish. But once it has gone live, you cannot make changes to the design without losing all the data. So if this becomes necessary, you must dump the data out to ASCII 'flat' files, change the structure and then reload the data—rather a lengthy process, as Benchmark 10 shows.

Data input and updating

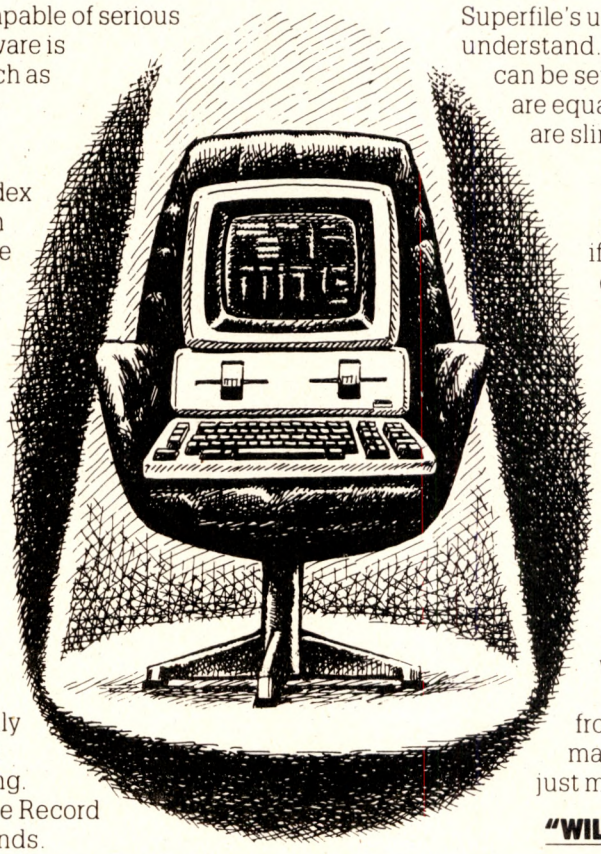
Entering data involves simply positioning the data on the name of the box you wish to update, and pressing RETURN. Data must be entered in the correct order; for instance, you couldn't enter the name of a house without first indicating what street was being processed. When you first display a screen, the cursor is on a window name. To move around among windows, you move the cursor up and down; to move to a data area and enter information, you just press RETURN. You can then either enter the name of, say, a house whose delivery information you want to amend, or scroll through the existing houses in the road in alphabetical order by moving the cursor up and down, or insert a record by typing a semi-colon and then typing the new information. Rows of information may also be deleted, but again only in the proper order—you can't delete a road record if there are houses defined as being in that road. Data browsing has some curious featues — for instance, when you get to the end of the available information, Everyman displays the first line again. This has the benefit that if information is added out of sequence, Everyman can display it in sequence after scrolling through those rows preceding the new record.

Everyman also provides a facility for updating records in a batch, using a procedure called Automatic Run, which

SOME SEARCHING QUESTIONS TO ASK A DATABASE MANAGER

Now that microcomputers are capable of serious data storage, the hot phrase in software is 'database manager.' A good one, such as Superfile, turns a micro into a hyper-intelligent filing cabinet, combined with an amazingly deft assistant.

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"DO YOU KNOW THE FACTS OF LIFE?"

"In real life, everyone changes their minds about the structure of their databases. Can you adapt? Can you hold many different sorts of information at once? Can you find someone who says they're called 'Smith' when they're actually 'ssmythe'?"

Superfile has a completely flexible structure. A user can change the shape of Records after he has started to enter data. He can store as many different kinds of Record as he wants. Superfile also has a unique 'sounds-like' searching facility – very useful for anyone who deals face to face with the public.

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"Do you insist on storing everything in fixed length spaces, so that 'Mr Ho' takes up as much room on the disk as 'Miss Featherstonehaugh-Willoughby-Fanshawe-Tupman'?"

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is also used in the printing of reports.

Screen Display

The format in which Everyman records are displayed is fixed by the program. The amount of information displayed, and its exact location on the screen, are under the control of the user.

For example, if you need to look at more information about the house or the road than just the identifier, you can reveal all the items for a particular window just by putting the cursor on its name and pressing question mark.

Alternatively, you can hide items you don't want to see, using the DELETE key. This too affects only their display. The final option in display is to get another 'view' of the data structure. The default view is determined by the way the original project diagram was drawn. In our example, House was to the left of paper, and so the default is to show Paper information below House and Road. But by pressing the asterisk key one can change this view. To see the structure in terms, not of houses to which papers are delivered, but of papers delivered to houses, you put the cursor on the Delivery window and press the asterisk key. In the example, you could then tell how many people have ordered a particular paper, perhaps in order to tell them that supplies have not arrived from the distributors. So while the general format of displays is determined by Everyman, there is sufficient flexibility for most requirements, and the user is preserved from having to set up individual formats.

Printed Reports

To print a report (rather than simply get a dump of the screen, which is available on any screen through the TAB key), you must design an appropriate report format. Everyman has facilities for producing reports containing an introduction, a body containing information about each record selected for report, and a conclusion. You can have just the conclusion if you wish, to give simply totals (but don't expect this to be a quick way of summarising your information, as Benchmark 9 shows — you would do better to include running totals within the project design, which would be kept up-to-date as you enter data). Reports may be printed, or sent to a file for subsequent reprocessing (perhaps in a word processing package). Reports with a body may produce control breaks to allow the calculation of sub-totals using Everyman's temporary totals facility. The format is reasonably flexible, but must be specified using row and column numbers. Selection of fields, of records and of 'boxes' is allowed: this is achieved in part by arranging the data structure in an appropriate way on the screen before the instruction to print is given. Report formats are saved for subsequent re-use, but I couldn't find a way to edit an existing format.

Selection

Groups of records may be selected for display or printing by activating stored selection criteria. These may be set up when the project is designed, or added temporarily during a run. You can also add them to the project design (but at the price of invalidating any existing 'drivers' — see 'Tailoring' below). The usual comparison operators are available for selection, including 'string contains', and may be combined with And and Or; brackets may be used to alter the order of the valuation.

'Everyman allows two types of calculation on data input, in addition to running totals. An item may be derived, or it may be evaluated.'

When working through records in a box, they appear to be sorted in order by their identifier. For dependent boxes, the order will depend on the 'view' of the structure which the user has chosen. Apart from this automatic ordering, there does not seem to be any other method of sorting data.

Calculation

Everyman allows two types of calculation on data input, in addition to running totals. An item may be derived, or it may be evaluated. A derived item is calculated once only, when the record is first set up, and the value stored in the item permanently. An evaluated item is recalculated each time the record is updated, and is not stored — only the formula for the item is stored. Either kind of calculation may be based on items within the same box, or on items from other boxes in combination. A large number of arithmetic and comparison operators are available, including the ability to set a logical variable true or false according to the result of the outcome of a comparison involving other data items. Comparisons may also be used to initiate error action — for instance, in the college example, a check is kept on the total number of students to be enrolled on a course, and users prevented from enrolling more students once a course is full. These comparisons are accomplished by using an if . . . then . . . else set, which may be nested using brackets for sub-expressions.

Tailoring

Everyman provides the ability to create what it calls 'drivers', which are actually sequences of Everyman operations 'remembered' by the package. To set up a driver, you simply type at the keyboard the same sequence of operations as you would normally carry out interactively. To start up the driver, you call it up from the Project menu. This makes it possible to do some tuning to particular applications, such as giving special views of windows, working only on selected sets of information, running reports automatically and so on, but does not have the full flexibility of a command language.

There are no special measures, such as passwords, to protect data from unauthorised access. However, it would be possible using a driver, to provide a 'normal' mode of access which looked only at certain items through particular windows. But there seems to be no means of enforcing this.

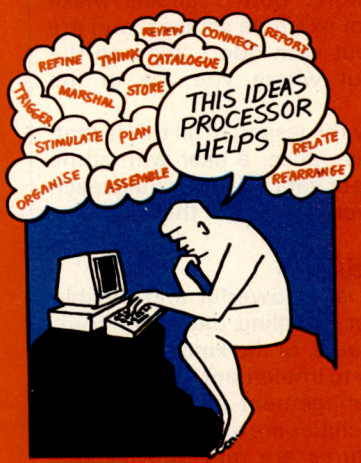
Links with outside

Everyman provides the ability to dump its own files to ASCII text files, with the information appearing in an order predefined by arranging the windows appropriately on the screen. It can restore from these files or from files created on the same principle by other programs. Whether this allows you to load from any particular existing application files will depend on the structure used to store the information at the moment.

User Image

Everyman is a powerful and flexible package. It is very visual in its approach, and exploits fully the greater flexibility and capacity of current systems. In the project structure creation phase, for instance, its use of the screen facilities is excellent, and I found them a great help, not only in telling Everyman about my data designs, but in getting them right in terms of my data structure and processing requirement. Using screen drawing with ready-made boxes, it is much easier to try out several designs. Everyman has still been limited in this respect by the considerations of portability: for instance, the structure diagrams do not have arrow-heads on them (direction of dependence is indi-







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cated only by vertical positioning), because although the Sirius can support this feature, the IBM PC in its basic form apparently cannot.

But the flexibility involves the user in a high degree of interaction. For my taste, the desire for easy portability has made it more difficult for the user to work in that highly interactive fashion. For instance, moving around within Everyman involves using ESC, RETURN, space, and the cursor keys, together with some character keys such as semi-colon, colon, quote symbol, and equals sign. The cursor keys do not always have the effect you would expect, and all the other keys except equals are not obviously related to their function. Both the Sirius and the IBM PC have function keys, and can be programmed to display on the screen a reminder of the current meaning of those keys — indeed, this feature is used for two functions on the Sirius. But Everyman would have been better as a package had more use been made of those function keys, rather than using 'normal' keys perverted to those functions. (A skilled user or a dealer could still do this, but the manual would then be out of step with the keyboard.) There is a summary card showing all the keys and their actions, which does help quite a bit. There is also Help available (from function key 1 on the Sirius), but the trouble with flipping screens to get help lies in remembering what the Help screen would say when you come back . . .

There are, however, many details which have been well implemented. For instance, Everyman always asks you at the start of a session if the printer is to be used, and if it is, checks that it is on-line — so you don't get the system hanging up when starting to print a report, as you do on many other systems. The method of specifying paper dimensions is good, too — a picture of a piece of paper is displayed, so that, if you wish, you can enter the size of margins, page length, etc, by entering the appropriate number in the margin in question — word processing package authors, please note!

On the other hand, while you can interrupt a batch process which involves printing, if you specify that you want to use single sheets of paper (because the program waits for confirmation that the next sheet has been fed), there is no other clean way to interrupt such batch processes. You can do so by resetting the system, but that corrupts the database. This is a real problem on a system which takes quite a time to process a file of any size. Vector says that both the lack of an abort feature and the slowness are due to the interpreted version of Pascal in which the program is written. The company is currently investigating several Pascal compilers, in the hope that both these problems can be solved.

Overall, I found the Everyman approach very helpful once I'd got used to it. That took a little longer than I would have expected, but because it is a novel and unusual package rather than because of any particular difficulty in use.

Documentation

Everyman comes with a Tutorial Guide and a Reference Manual, both of which are typeset and printed on paper slightly larger than the IBM PC manuals. The structure of the manuals was quite helpful — a table of contents at the start of each chapter, summaries of control keys and operations used within the chapter on a single page at the front, and so on. The Reference Manual has an index, though the Tutorial Guide does not.

The Tutorial Guide uses the college project I referred to earlier, and takes you through looking at the various windows with existing data, before showing you how to set up another version of it from scratch. It covers virtually all the main Everyman features, and finishes up with a number of examples (also included on the tutorial disk) of more complex structure diagrams. On the whole, this approach is very helpful, but I would have preferred a bit more on concepts than the short introduction which precedes the examples.

The Reference Manual takes the opposite approach, and starts with a quite full and useful (but very dense) chapter on building models, before going on to examine each element of the package in turn. But it is not comprehensive: for instance, I could find very little about the reference link, which seemed to be a potentially very useful feature. Both manuals make good use of example screens, and are well laid-out with good clues on the page about where you are in the manual.

Probably the lesson of all this is that, with perseverance, a user with some experience of data analysis could teach himself Everyman from the manuals.

Conclusions

Everyman is a powerful and flexible package for handling data with complex structures, of the kind that would not be easy to implement in a traditional data management package. Its interactive facilities are excellent — many of the features are rare outside full-blown database management systems which require a programming language interface — and its batch processing features, though slow, also provide a good range of function. Many of Everyman's features are implemented in a way which reduces the amount of work needed by the user in manipulating related data. Some aspects of the user image could be improved, but all in all Everyman is a very good package which is both innovative and British! If Everyman's marketing and support is as good as the software then it will be a real success.

END

Summary

Package Type	Database management, effectively with variable length records. For those experienced in data analysis, and for committed users without that background. (V,E Roundup categories, *PCW* December '83.)
Facilities	Storage and retrieval of character, date and numeric data in format which, while fixed for parts of database, effectively allows varying length records overall. Powerful data display, calculation, selection and reporting features.
Drawbacks	Batch facilities are slow — so slow that it becomes very important to get data design right before entering a lot of data, as alterations require copying database out and back. Sorting only on key fields, one per data group.
Ease of Use	Good once you've got the hang of it.
Error Messages	Mostly good, a few very unhelpful.
Documentation	Good.
Costs (ex VAT)	£475 single end user. Special arrangements for multiple copy purchase. Hot-line and software updates free for first year, £50pa thereafter.
Supplier	Vector International, Vector House, 6A Lower Teddington Road, Kingston-upon-Thames, Surrey KT1 4ER. Tel: 01-943 1257.

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NETWORK NEWS

Peter Tootill gives his summary of what's new in the telephone networking world

I must apologise for a couple of wrong numbers that have slipped into Network News. I hope all is now correct, but if you know of any that are not, please let me know either via Liverpool Mailbox or *PCW*.

New systems

Computer Answers BBS

The magazine *Computer Answers* ran a board experimentally for a couple of weekends in November, and by the time you read this, it should have a permanent one. The phone number is 631 3076 and it's a 24-hour system, probably running TBBS software. I'll provide further details when they are available.

CBBS Chiltern

This board was due to start in December and so should be running by now. The phone number was expected to be (070 703) 28723, but it would be best to check with one of the other boards just in case. Again, details should be confirmed next month.

Operating times of boards

All systems have set operating times and methods (for example, ring-back systems). Details of these are given in the listings with the various phone numbers and they will also be quoted on the board itself. Please take note of the details and don't call outside system hours unless you want to talk to the operator. Especially *DO NOT CALL* in the middle of the night unless you are sure the system works at this time. Remember most of the BBS are run as a hobby and being woken at 3am can put a strain on even the most harmonious of households! Another thing that can be very annoying is to answer the phone, only for the caller to hang up without a word. If you call a BBS and a person answers there will be a reason for this, so hang on and ask, wait for the answer tone before you switch your modem on, or put the handset in the coupler. If you're using an auto-dial type and don't get through when you expect, ring back and check that you've got the right number and operating times.

Viewfax 258

There are many separate databases contained within the Prestel system, and they are provided and maintained by many different organisations. One well known one in the microcomputer world is Micronet 800, but there are other areas of Prestel that will be of interest to micro users. Viewfax 258 (which starts at page 258) is a database comprising news and gossip from the micro world, and telesoftware. Much of it is for the BBC Micro, but other systems are supported (some of the software is even free!). It is the home of the infamous 'MicroGnome' who has his own idiosyncratic way of writing about news and products.

Viewfax 258, unlike Micronet 800, has no subscription and is open to all Prestel users.

For more details phone (021) 705 0258.

German bulletin board

A German micro magazine has set up a bulletin board under the name 'TEDAS'. I believe that it's a 24-hour system. You'll really need to be able to speak German to use it, but a translation of some of the menus is available on CBBS-NE.

The telephone number from the UK is (010 49) 89 596 422.

Another system is planned in Germany with others in France and Finland. Any developments will be passed on as soon as news comes through.

Network jargon

You may have been wondering what the letters 'CCITT' refer to in the context of modem standards. Well, I can reveal that they stand for the *Comité Consultatif International Téléphonique et Télégraphique,* which in translation means the International Telephone and Telegraph Consultative Committee. It is a committee of the International Telecommunications Union, which is a United Nations agency. The CCITT is responsible for data transmission matters and produces among other things the standards for modems and the like. The V24 interface is an example, as is the V21 (300 bit/sec) modem which is the most popular for communications between terminals and mainframe computers. This is also the standard used by the microcomputer bulletin boards.

Another CCITT standard is the V standard which allows communication at 1200 bits/sec but in half duplex mode with one end transmitting at 1200 bits/sec and the other at 75 bits/sec. Normally you can turn the speeds round and the person who was receiving at 1200 can send at 1200 in turn. Prestel uses a subset of this standard with no facilities to turn the speeds round, so there is no way you can talk to Prestel at 1200 bits/sec.

It's nice to think that there's such an international standards organisation in this context. Otherwise, each country would have its own set of standards and no one would be able to talk to anyone outside his own borders. That wouldn't be so much of a problem for many of us (you know the cost of international phone calls!), but it would be for businesses. However, having international standards means that a modem manufacturer can produce for a much bigger market than would otherwise be the case, and in theory prices will be lower. The existence of these standards has enabled the new generation of 'modems on a chip' to be produced. There is no point in producing a complicated IC that will only sell to a few people in one country; you need to sell thousands to make it economical.

The only fly in this international ointment is the fact that the USA has its own standards for modems. For example, in North America, Bell 103 is the normal 300 bits/sec standard, and this is incompatible with V21. With more recent standards there has been an attempt to introduce some compatibility, and V23 and Bell 202 use the same frequencies at 1200 bits/sec, so that modems using one or the other should be able to communicate (does anyone know if it works?).

Next month I'll give details of the various frequencies used by the common standards.

UK systems run by commercial organisations, which are free at least in part:

DISTEL. Tel: (01) 679 1888. Run by Display Electronics (new and surplus electronic and computer equipment, components, etc). The system provides information about stock lines, credit card sales, and some message facilities. 300 baud only at present. Cost: free. 24 hours.

REWTEL. Tel: (0277) 232628. Run by *Radio and Electronics World*, the publishing side of Ambit (electronics components suppliers). Information on stock lines, some message facilities, credit card sales; the latter only for subscribers. 300 baud only at present. Cost: limited areas free, remainder £10 pa. 24 hours.

MAPTEL. Tel: (0702) 552941. Run by Maplin (electronic components and microcomputers). Provides information on stock levels, credit card sales to existing customers only. 300 baud only. Cost: free. 24 hours.

Subscriber commercial systems in the UK:

PRESTEL. Subscribers only: Prestel consists of a database made up of individual pages provided by many different organisations (not by Prestel

NETWORK NEWS

American/Canadian networks

TYPE	SYSTEM NAME	NUMBER	NOTES
Forum 80	HQ System	0101.816-861 7040	
CBBS	HQ System	0101.312-545 8086	
FBBS	HQ System	0101.312-677 8514	
ABBS	Ottowa, Ontario	0101.613-725 2243	
ABBS	HQ system	0101.703-255 2192	
MABBS	Fort Walton Beach	0101.904-862 1072	
Bull-80	Alabama	0101.205-492 0373	
Conn-80	Colour Computer	0101.212-441 3755	colour graphics for TRS-80 Colour

European networks

ELFA	ABC-MONITOR Sweden	010.468 730 0706	Half duplex
ABC-Banken	Halmstadt, Sweden	010.463 5110771	
ABC-MONITOR	ABC Club of Sweden	010.468 801523	Passwords required
CBBS	Gothenburg, Sweden*	010.463 1292160 010.463 1690754	75/1200 baud 300 baud

*After receiving the tone and connecting your modem, either type <C/R> or type: <COM C/R>. The system then asks for a password which is: 'cbbs' *in small letters*!! If you only get '>' when you dial up, the system needs resetting and you type <I> C/R.

itself). 1200/75 baud service at local call rates for a large percentage of potential users. 300 baud service on London telephone number only, at present. Cost: domestic subscribers £5 per quarter and no time charges outside peak periods, 80 per cent of pages are free. Business users: £15 per quarter and 5p/minute up to 6pm and Saturday mornings, no time charges outside these hours (time charges also apply to domestic users). Information: tel: Freefone 2296.

MICRONET 800. An organisation providing information within the Prestel database specifically aimed at microcomputer users. Service details as Prestel. Cost: £50-£75 joining fee (covers acoustic coupler and software—for a limited range of machines at present) and £8 per quarter on top of normal Prestel charges. Information: Micronet 800, 8 Herbal Hill, London EC1R 5JB. Tel: (01) 837 3699.

Subscriber business systems in the UK:

Commercial systems aimed at business users:

TELECOM GOLD. Info from: Julie Ireland, 42 Weston Street, London SE1 3QD. Tel: (01) 403 6777.

COMET. Message handling system giving user facilities for leaving and retrieving messages: costs £30 per month. Info from: John Douglas, BL Systems Limited, Grosvenor House, Prospect Hill, Redditch, Worcs. Tel: (0527) 28515.

UK networks:

CBBS North East . . . Tel: (0207) 543555. Hours: 2.30pm-9am daily. Hours: midnight-8.30am Bell (US) standards.

Mailbox-80, Stourport . . . Tel: (0384) 635336*. Hours: 6pm-8am daily (ring-back system).

Forum-80 Hull . . . (Forum-80 HQ) Tel: (0482) 859169. International electronic mail, library for up/down loading.

Forum-80 Users Group, PET Users section shopping list system. Hours: Tues/Thurs 7-10pm; Sat/Sun 1-10pm; nights, midnight-8am, US (Bell 103) standards.

Forum-80 London . . . Tel: (01) 902 2546. Electronic mail, library for down-loading. Hours: 7-10pm weekdays; midday-10pm weekends. Ring and ask for Forum-80.

CBBS London . . . Tel: (01) 399 2136. Facilities: electronic mail, program downloading. Hours: Sun 5-10pm.

Forum-80 Milton . . . (TRS-80 Users Group 80-Nett) Tel: (0908) 613004. Electronic mail, library, newsletter, TRS-80 information system. Hours: any reasonable time.

Mailbox-80 Liverpool . . . Tel: (051) 428 8924. Electronic mail, down-loading, TRS-80 information. Hours: 24 hours daily.

TBBS, London . . . Tel: (01) 348 9400. Hours: daily 9am-7am.

Note: Estelle. Tel: (0279) 443511 V21 (Datel 200); (0279) 441188 (Datel 600); (0279) 441222 (Datel 1200). For customers of STC Electronic Services. Office hours only.

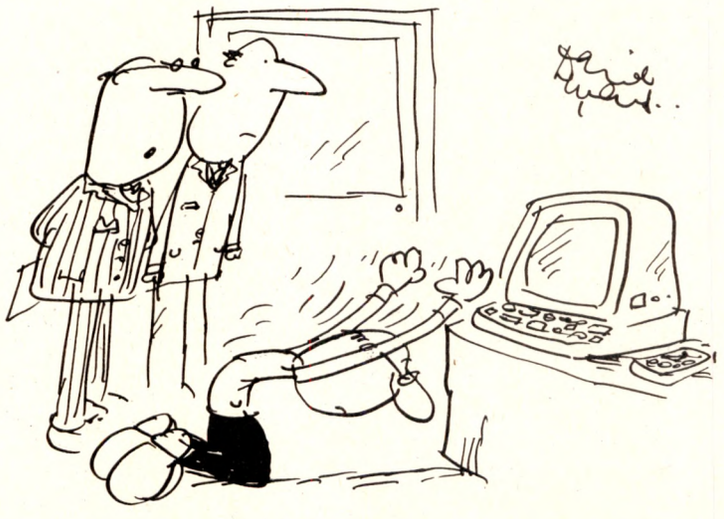
Efficient Chips for Atari dealers. Tel: (0249) 657744. Message facilities, down-loading, electronic shopping. Hours: 6pm-8.30am and all day Sunday.

Southern BBS. Tel: (0243) 511077. Messages, down-loading. Hours: 8pm-2am daily (ring-back system).

The above information is correct and current, to the best of my knowledge, but I would be pleased to receive corrections and updates, either via Liverpool Mailbox, or *PCW*.

*Ring-back system—dial the number, let phone ring once and then ring back.

END



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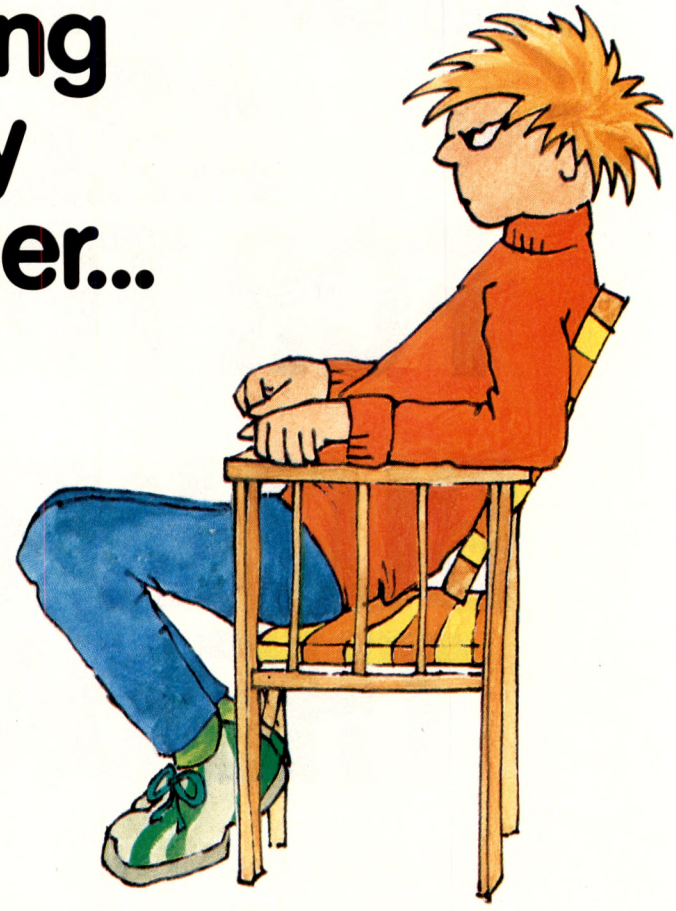
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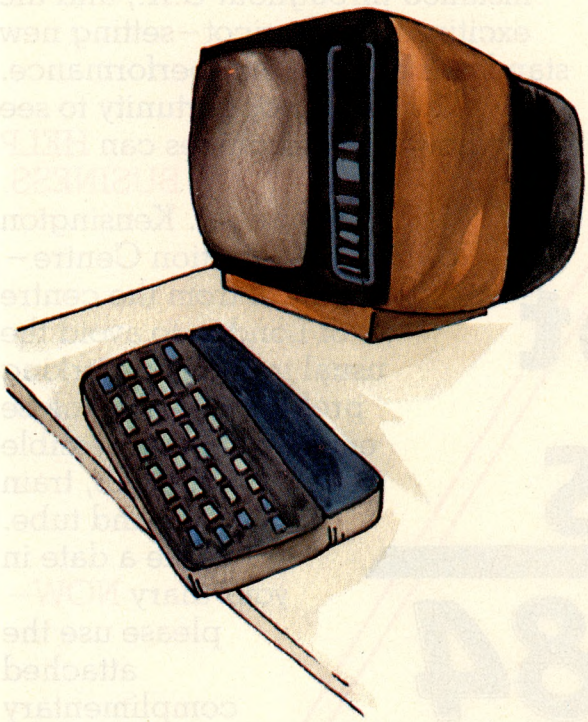
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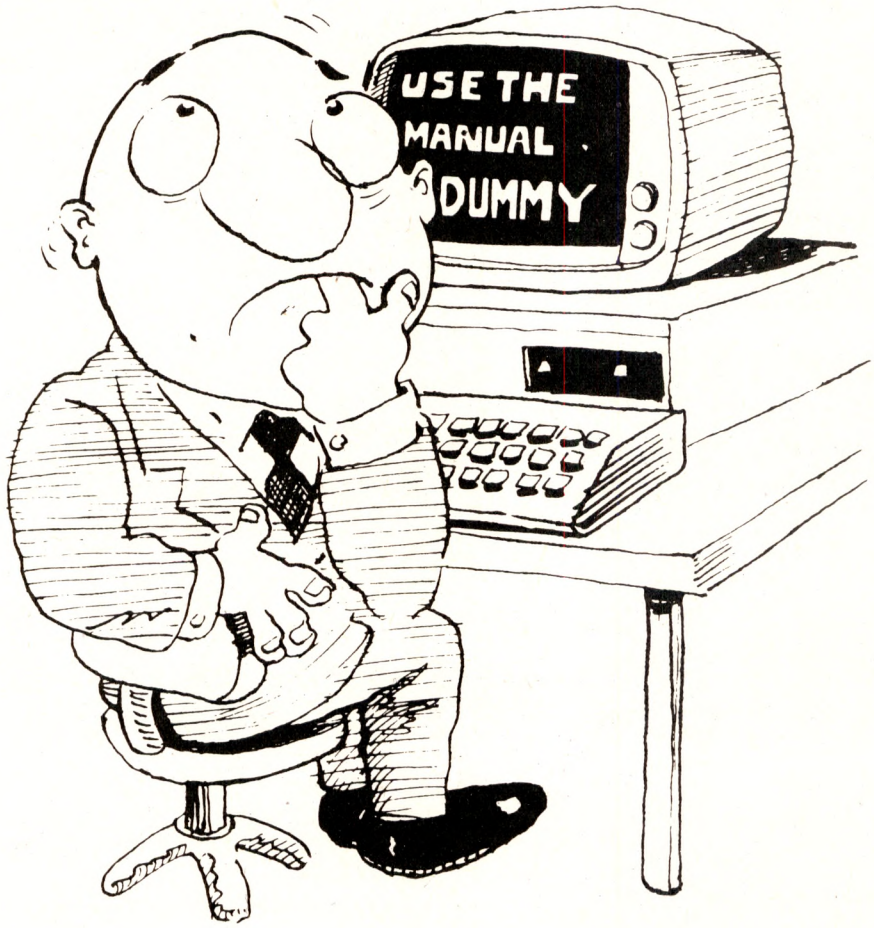
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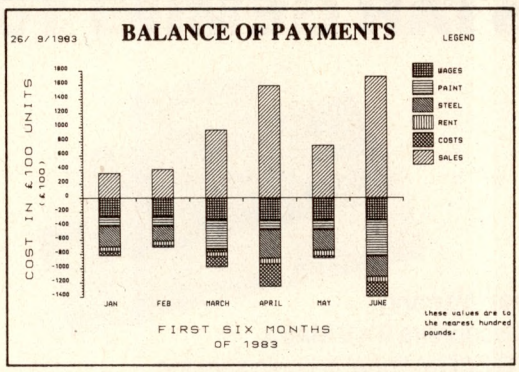
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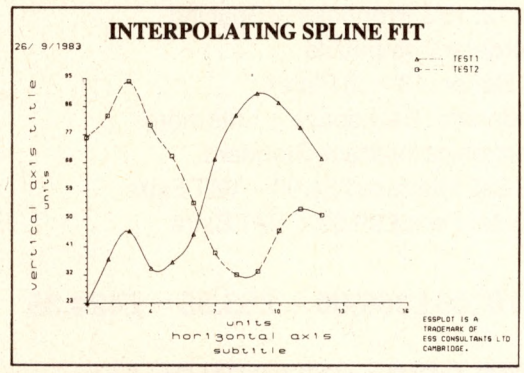


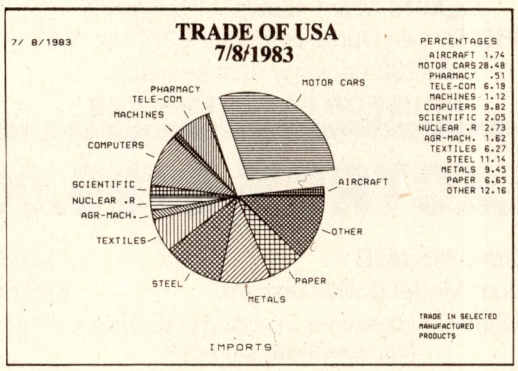
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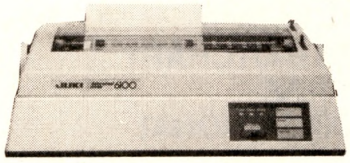
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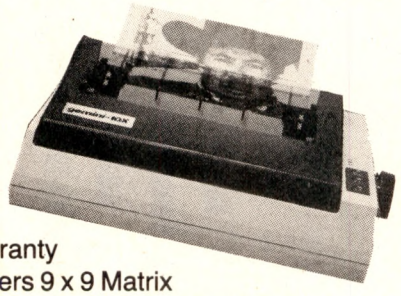
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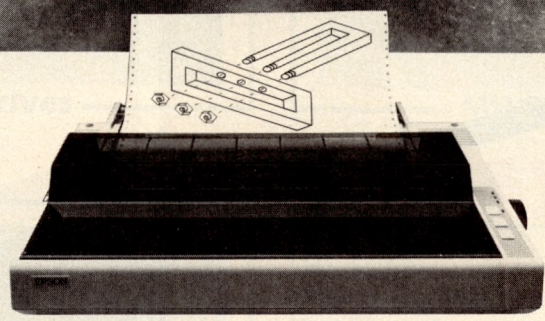
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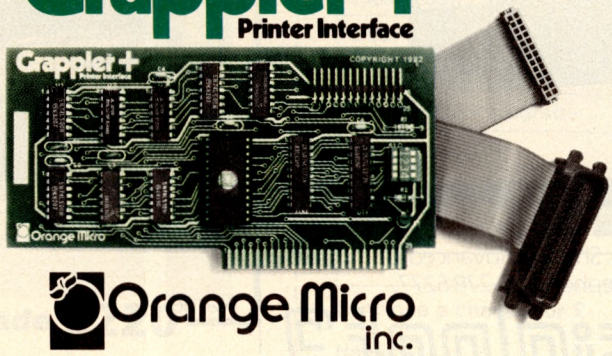
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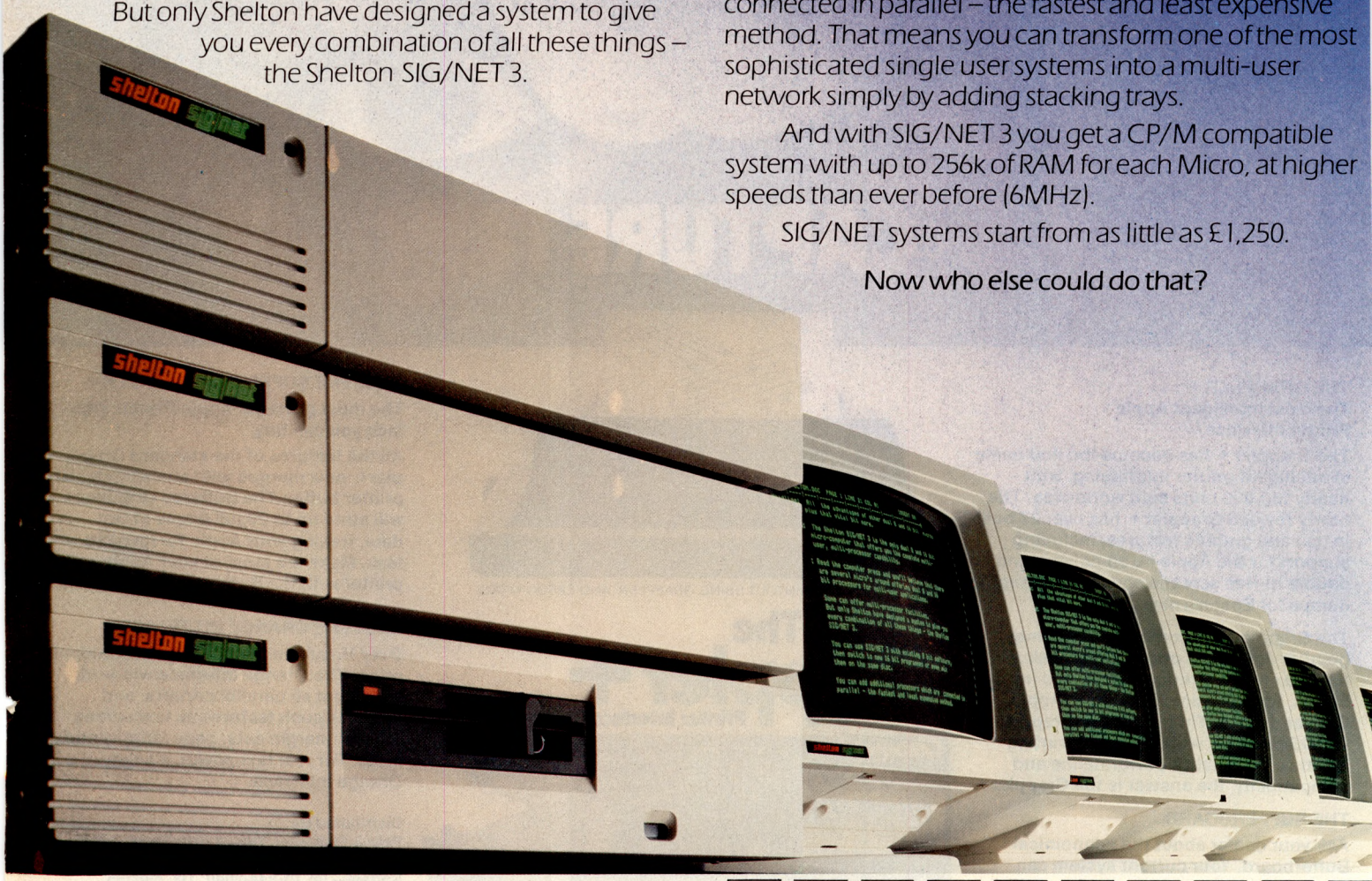
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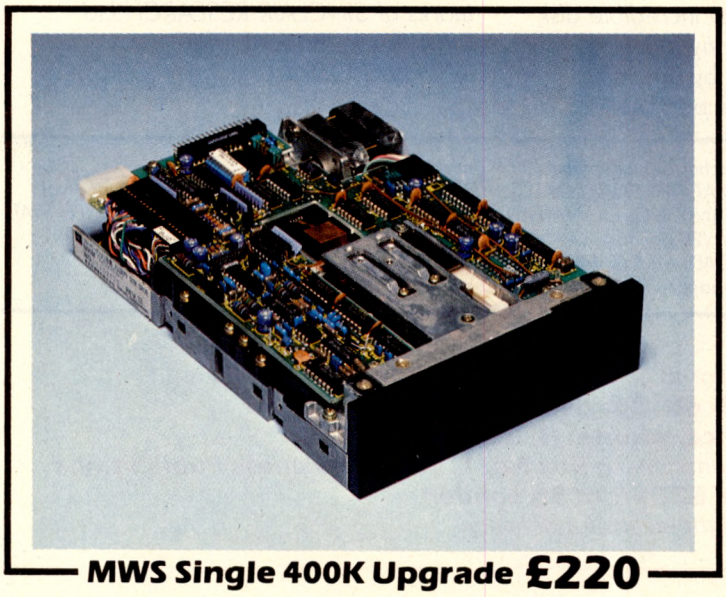
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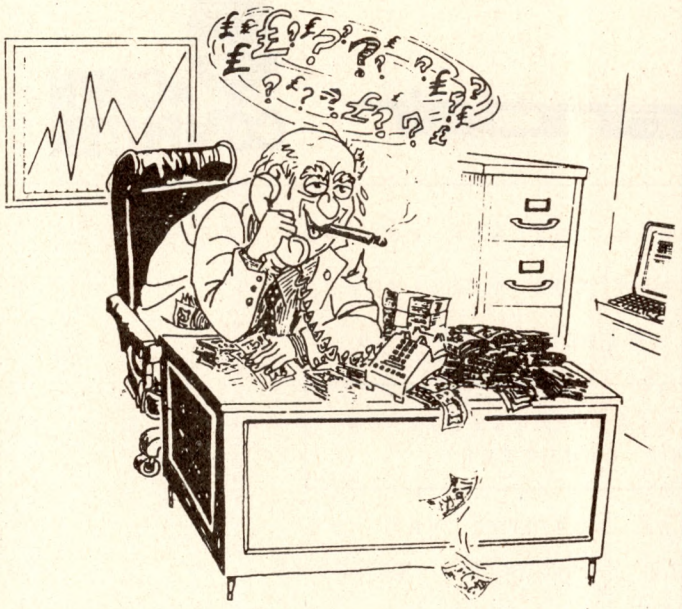
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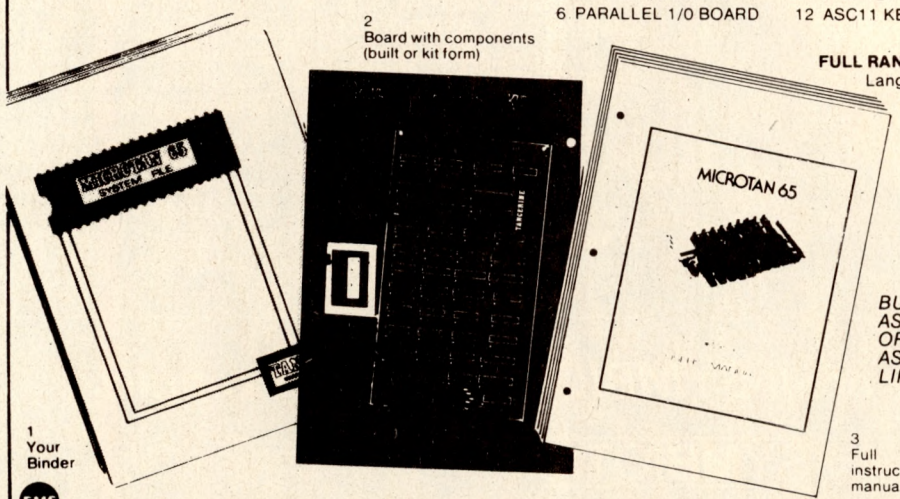
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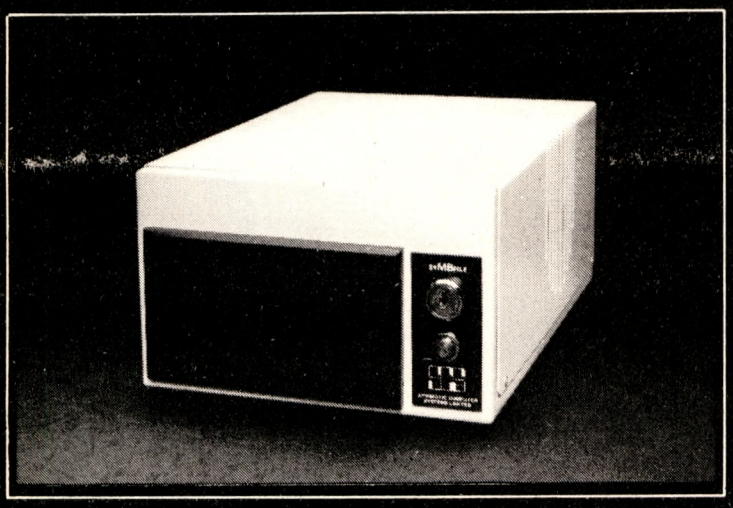
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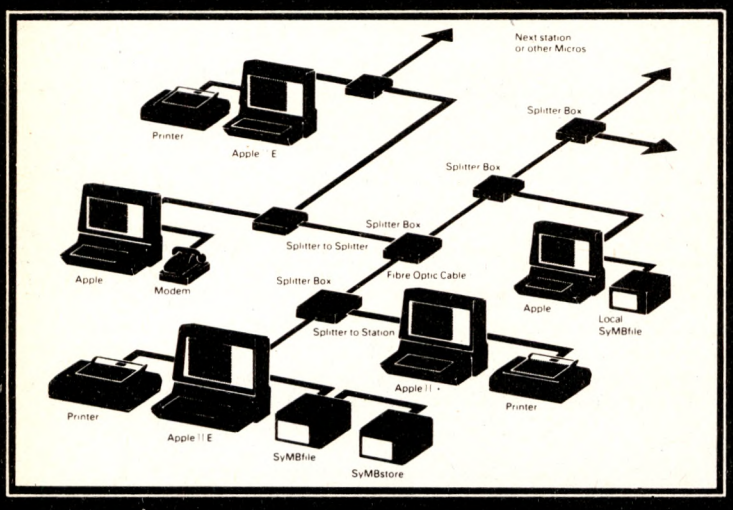
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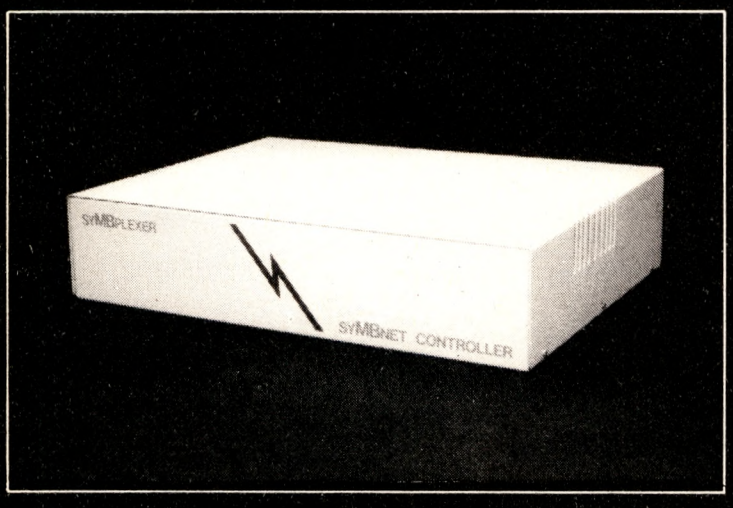
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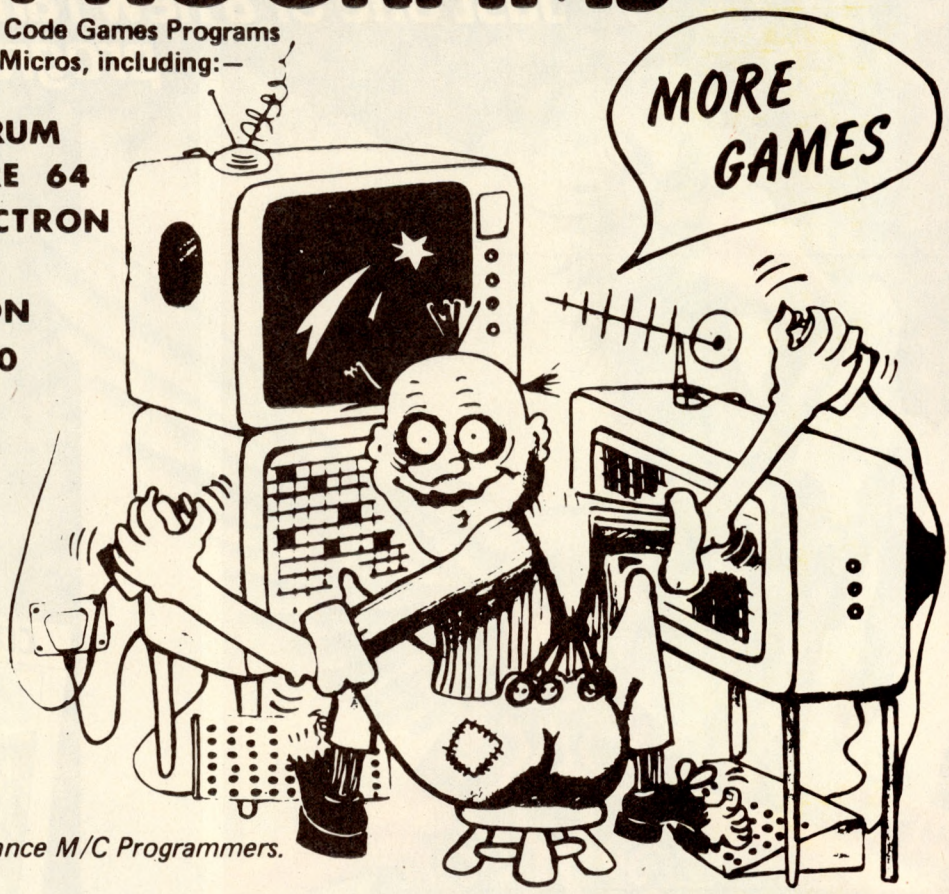
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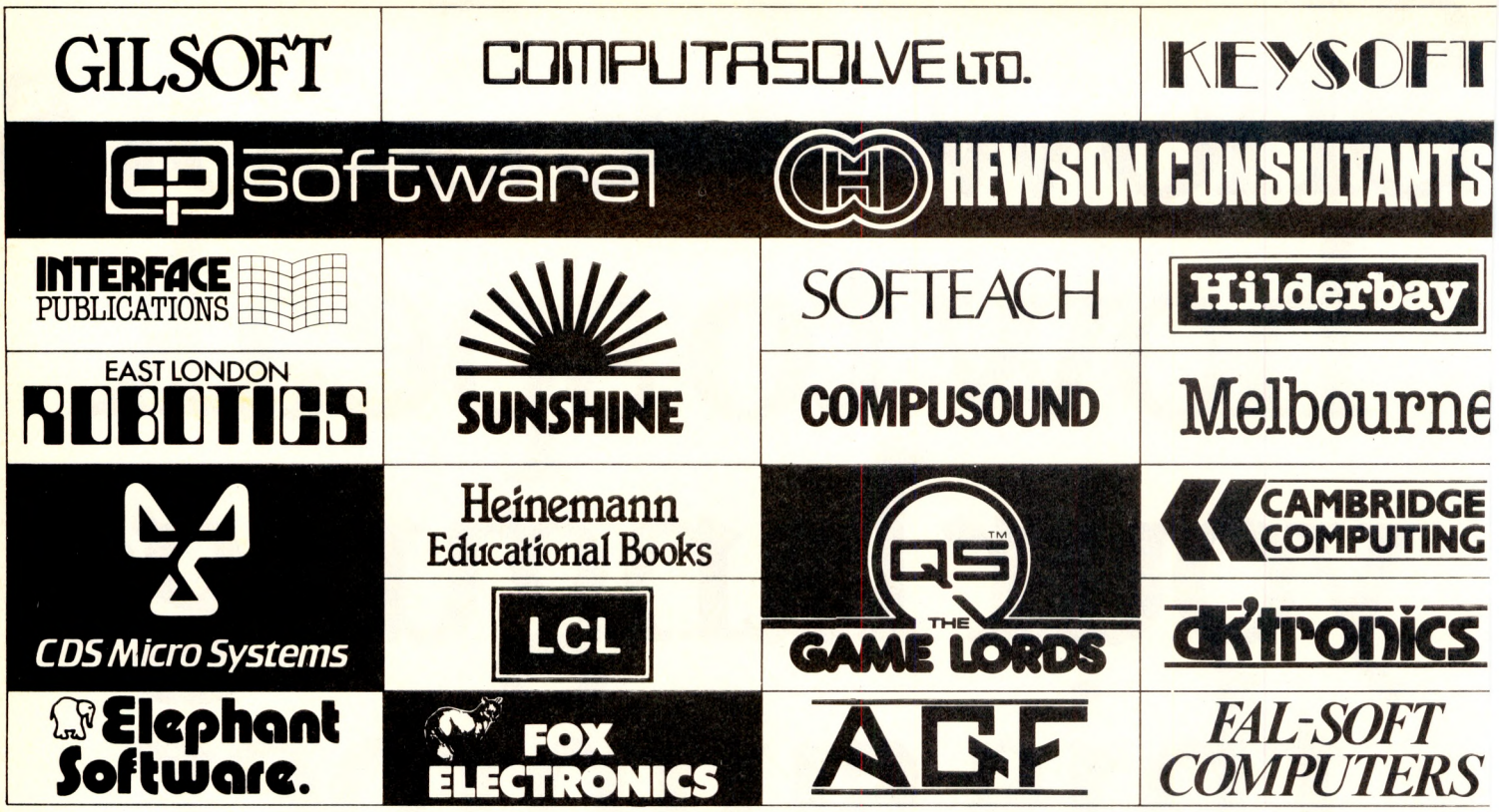
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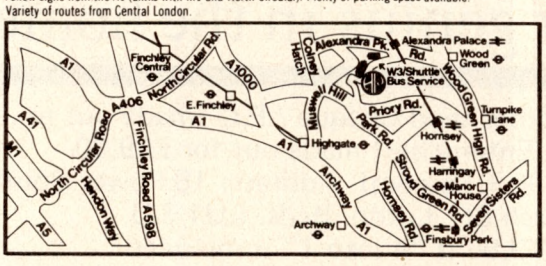
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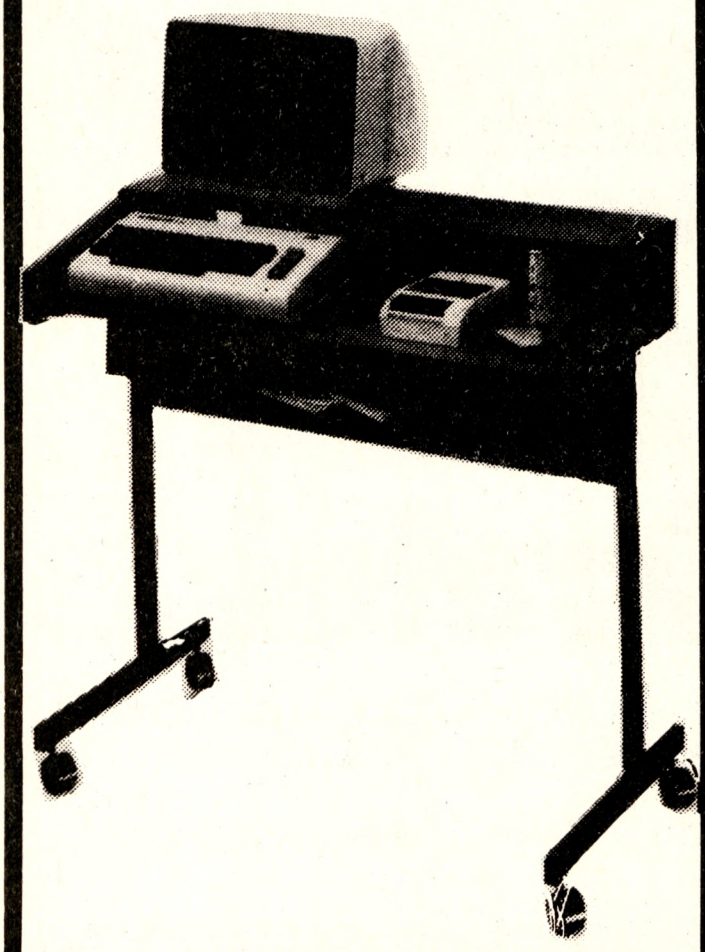


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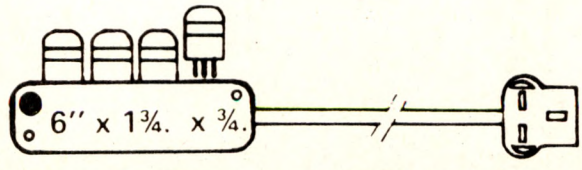
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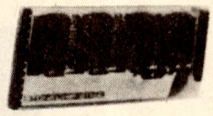
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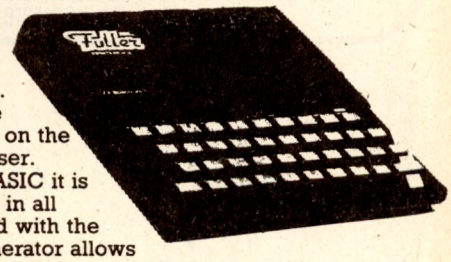
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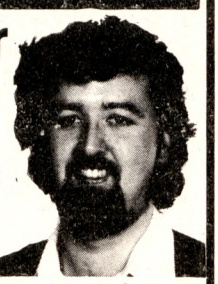
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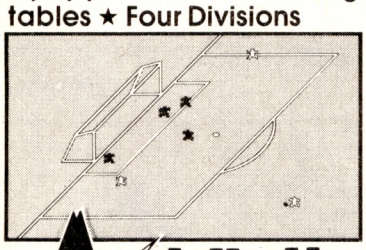
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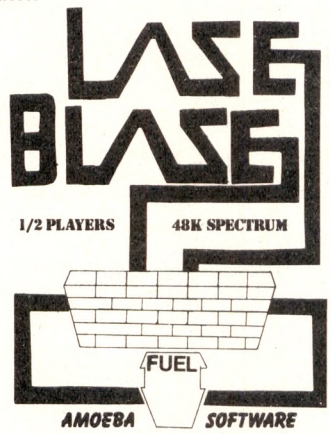
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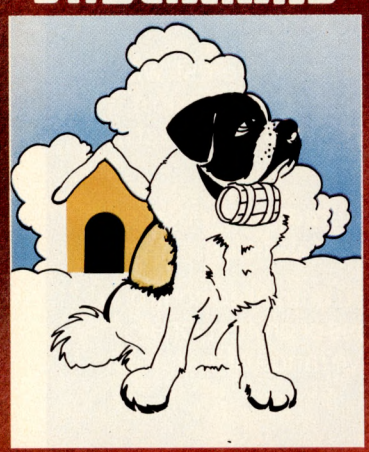


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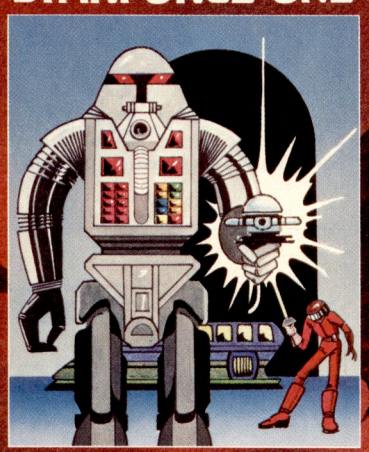


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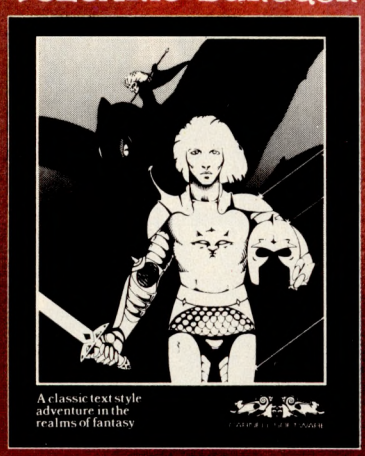


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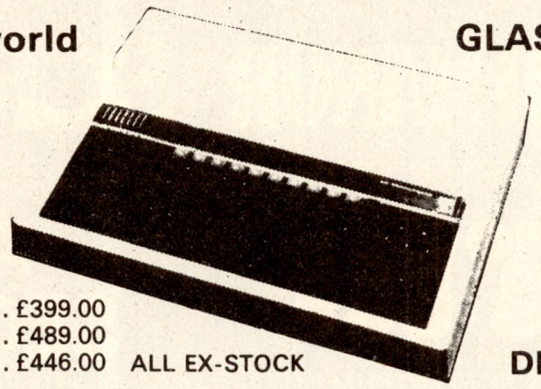
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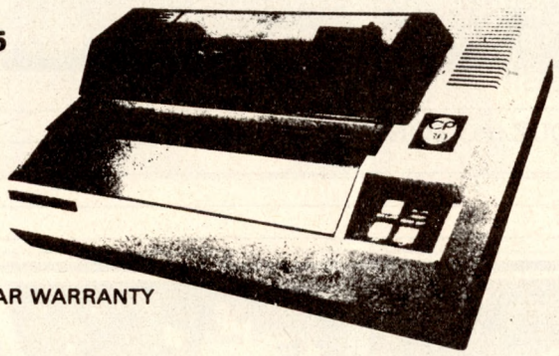


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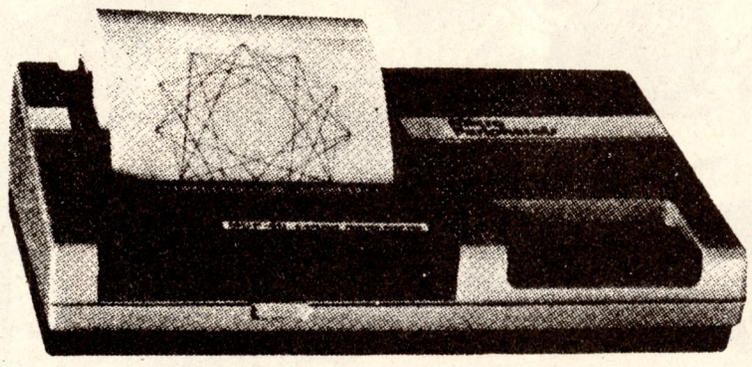
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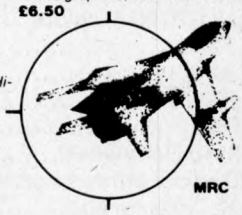
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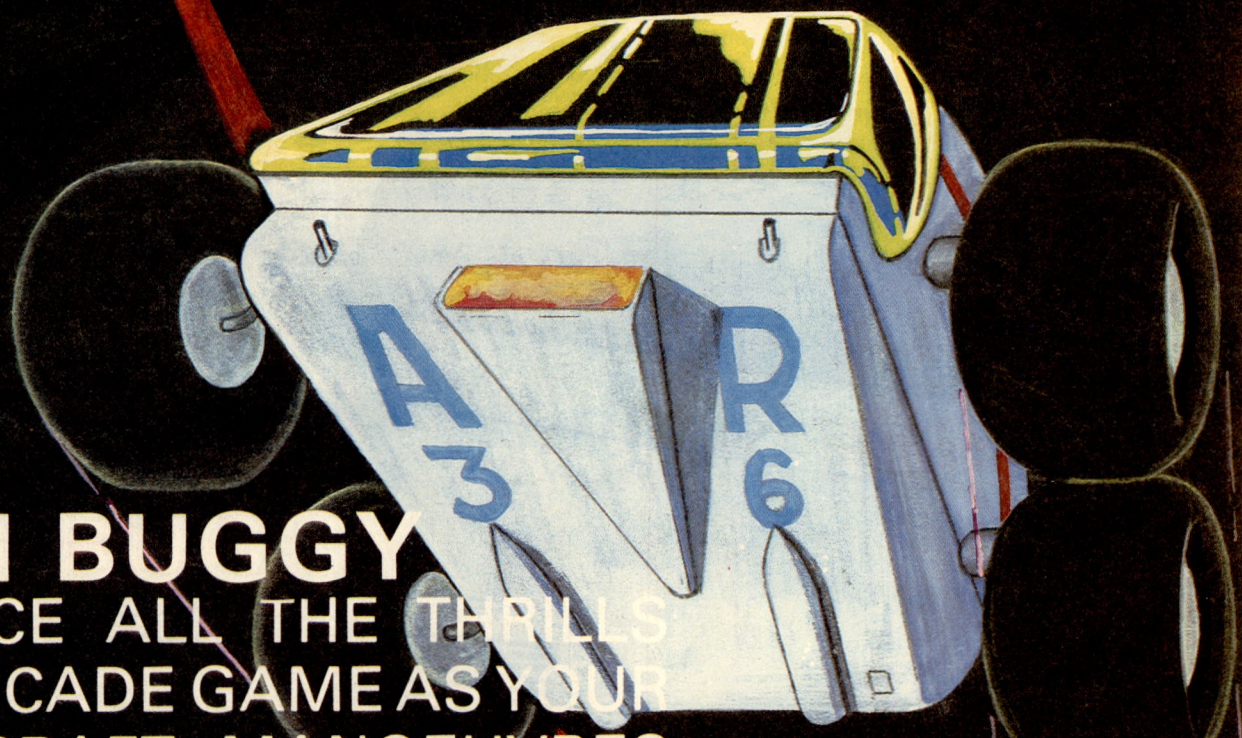
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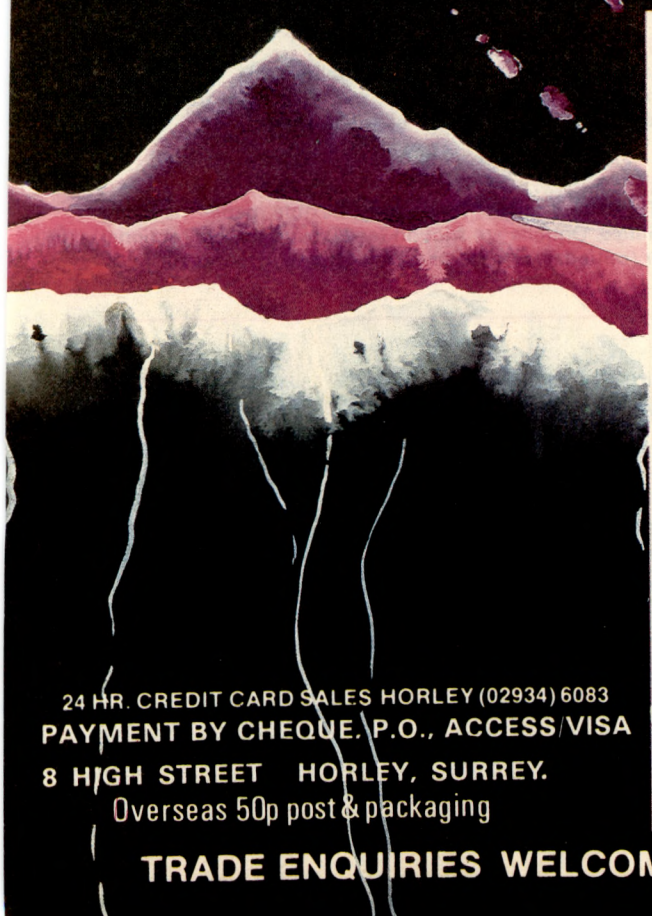
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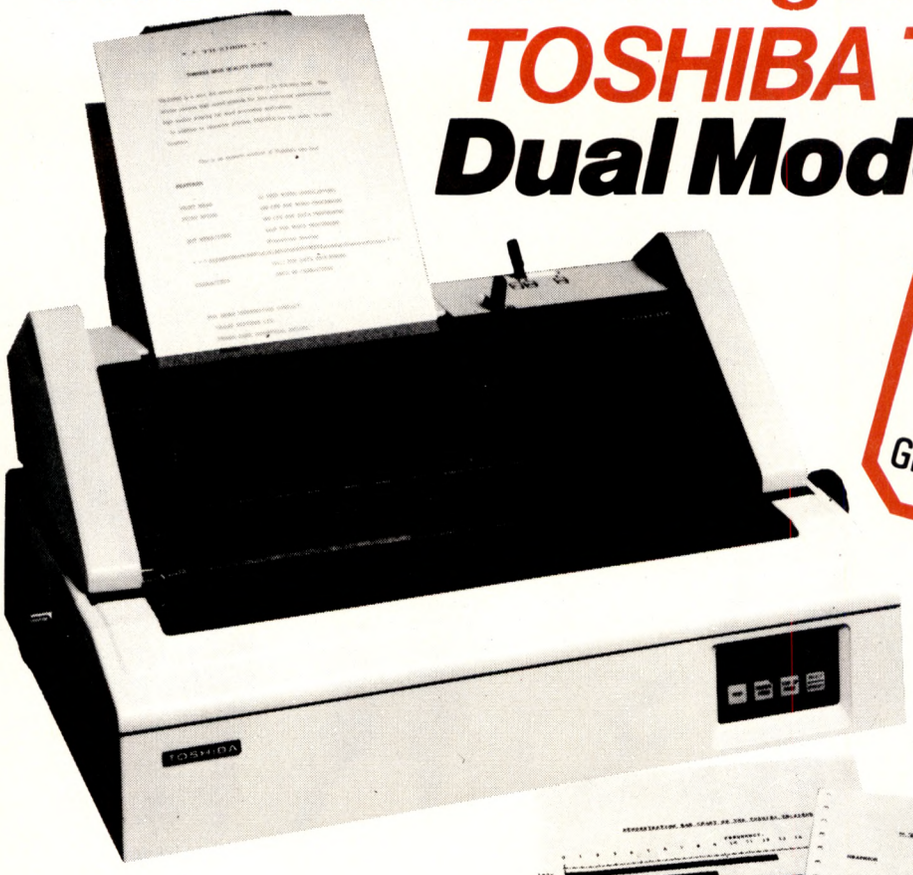
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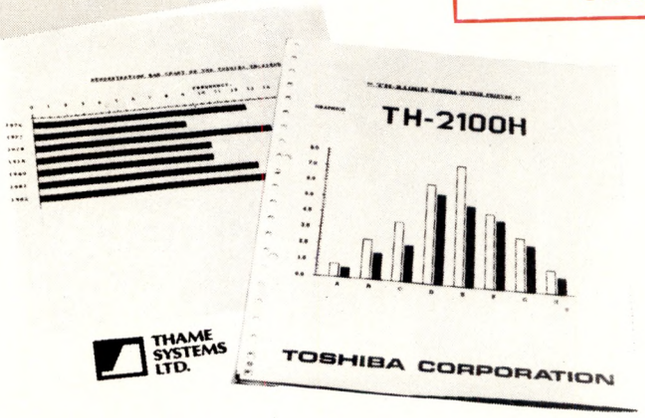
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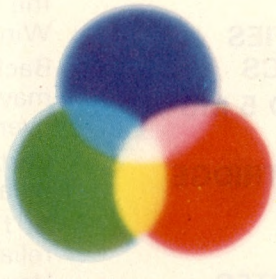
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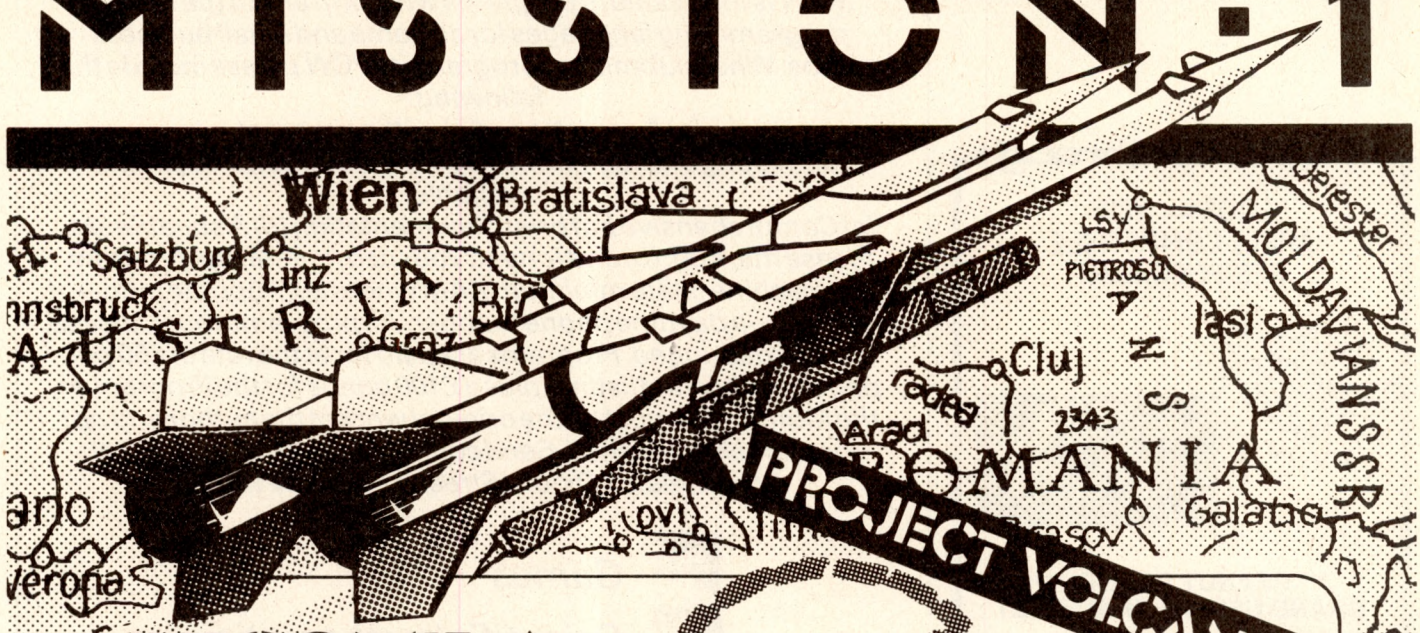
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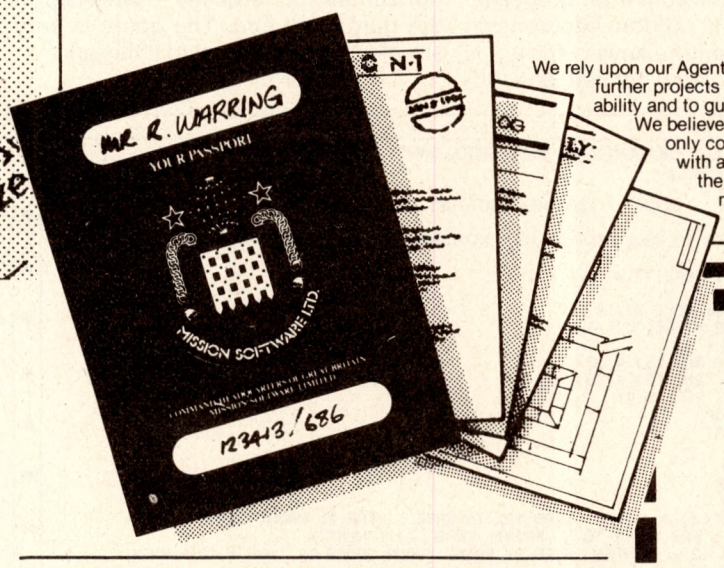
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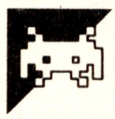

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APPLE STARGO

by John Grieve

'Stargo' is a simple game for a 48k Apple II, DOS 3.2. It will not run under DOS 3.3 without a converter program.

Stars appear at random positions on the screen. Using the keys U for up, N for down, left arrow for left and RETYPE for right, you have to prevent these stars forming a row of five — horizontally or vertically — whereupon the game will end. The game is very simple and will appeal to children.

```
10  HOME : PRINT "RANDOMIZING-PRESS SPACE BAR"
15  POKE  - 16368,0
20 X =  RND (7)
25  IF  PEEK ( - 16384) > 128 THEN  GOTO 35
30  GOTO 20
35  FOR X = 768 TO 889: READ V: POKE X,V: NEXT X
40  HOME
45  POKE 32,0: POKE 33,39
50  HOME
55  POKE 32,20: POKE 33,19
60 ST = 170:SP = 160:CV = 32
65 CH = 12:CV = 12
70 HX =  INT ( RND (3) * 20)
75 VY =  INT ( RND (3) * 20)
80  POKE 5,HX: POKE 6,VY
85 CO = CO + 1
90  POKE 776,ST
95  CALL 768
100  POKE 2,0
105  CALL 780
110  CALL 839
115  IF  PEEK (2) > 4 THEN  VTAB 12: INVERSE : HTAB 2: PRINT "GAME OVER ":
      NORMAL : FOR X = 1 TO 5: PRINT  CHR$ (7);: NEXT X
120  IF  PEEK (2) > 4 THEN  HTAB 2: PRINT "YOUR SCORE IS ";CO * 10 + HX +
     VY: VTAB 23
125  IF  PEEK (2) > 4 THEN  POKE 5,HX: POKE 6,VY: POKE 776,106: CALL 768: DEL
     10,35
130  POKE 5,0H: POKE 6,0V
135  POKE 776,SP: CALL 768
140 K =  PEEK ( - 16384)
145  IF K = 149 THEN CH = CH + 1
150  IF CH > 19 THEN CH = 19
155  IF K = 136 THEN CH = CH - 1
160  IF CH < 0 THEN CH = 0
165  IF K = 213 THEN CV = CV - 1
170  IF CV < 0 THEN CV = 0
175  IF K = 206 THEN CV = CV + 1
180  IF CV > 19 THEN CV = 19
```

PROGRAMS

```
185 OH = CH:OV = CV
190  POKE 5,CH: POKE 6,CV
195  POKE 776,CV
200  CALL 768
205  GOTO 70
210  DATA    165,6,164,5,32,193,251
215  DATA 169,170,145,40,96
220  DATA  169,0,162,0,160,0,72,32,193,251,177,40,201,170,240,5,162,0,76,3
     8,3
225  DATA   232,224,5,176,21,200,192,20,240,4,104,76,18,3
230  DATA  104,24,105,1,201,20,240,3,76,14,3
235  DATA   96,134,2,104,96,0,0,0,0,0,0,0,0
240  DATA   160,0,162,0,169,0,72,32,193,251,177,40
245  DATA     201,170,240,5,162,0,76,97,3,232,224,5,176,21
250  DATA   104,24,105,1,201,20,240,4,72,76,78,3
255  DATA    200,192,20,240,3,76,73,3,96,134,2,104,96
```

ATOM TURBO & CAKES

by Russell Wheeler

Not the most sophisticated of games, admittedly, but what do you expect on an unexpanded Atom?

In 'Turbo', you are driving the wrong way up a one-way street. The walls are inverse spaces, other cars (travelling in the correct direction ... .) are represented by 'H's. The difficulty increases as the game progresses.

In 'Cakes', you have to catch the cakes in the white square at the bottom of the screen.

In both programs, press CTRL to move left, SHIFT to move right. The author's high-scores are 244 and 21 respectively.

```
  0S=0;A=32773;B=A.R.%15;C=0;P.$12;?£E1=0
 20IF?£B001=127A=A+1
 30IF?£B001=191A=A-1
 40A=A-1;?A=32;A=A+2;?A=32;A=A-1
 50IFA>32781G.e
 51IFA<32769G.e
 70?33248=127;?33262=127;P.';S=S+1
 92C=C+33248;?C=8;C=A.R.%15;IFS>200G.f
 93A=A+32;IF?A=8G.e
 94A=A-32;?A=127;G.20
100eP."SPLAT"'"SCORE:"S;E.
200fC=C+33248;?C=8;C=A.R.%15;G.93

  0S=0;A=33262;P.$12;B=A.R.%31;L=3;C=5
  1B=B+32768;?B=115
 20IF?£B001=127A=A+1
 30IF?£B001=191A=A-1
 35F.N=1TOC;WAIT;N.;IFS=20C=C-2;IFS=30C=C-1;
 IFS=40C=C-1
 40A=A-1;?A=32;A=A+2;?A=32;A=A-1
 41B=B-32;?B=32;B=B+32;IFB>33249G.c
 50IFA<33249A=A+1
 51?A=127;B=B+32;?B=115;G.20
 99cIFB=A;S=S+1;P.$12S;B=A.R.%15;G.1
101L=L-1;P.$12"LIVES:"L;IFL<1;E.
103 B=A.R.%31;G.1
```

SIRIUS/VICTOR STARTREK

by Chris Blackmore

'Startrek' is a standard version of the game, running on a Victor or ACT Sirius 1. For a general outline of the game, see October Programs; specific instructions for this version are given within the program.

In design and operation, the program bears more of a resemblance to the versions found on minis and mainframes. The program is a bit pedantic in places, insisting on 'yes' or 'no' being typed in full and entered by the return key, but these inputs are easily changed to INKEY$.

```
1000 REM        ********************************************************
1010 REM        * STARTREK FOR THE SIRIUS, CONVERTED BY CHRIS BLACKMORE *
1020 REM        ********************************************************
1030 REM
1040 ON ERROR GOTO 6220
1050 OPEN "I", £1, "STARSCOR.NEW"
1060 CLOSE £1
```


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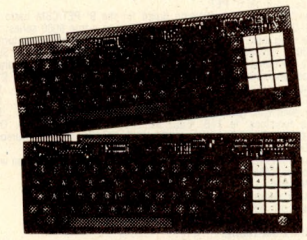
```
1070 ON ERROR GOTO 0
1080 CLS$ = CHR$(27)+"E"
1090 PRINT CLS$
1100 DIM A(7,7), S$(7,7), D(6), KP(62), KX(62), KY(62), G(7,7),
     H(7,7), SCORE$(20), WHO$(20)
1110 PI = 3.141593 : M9 = -9999 : GOSUB 5840
1120 DEF FNR(X) = INT(X*100+.5)/100
1130 S9 = 0 : GOSUB 4380 : GOSUB 5280 : GOTO 1150
1140 S9 = 0 : GOSUB 4380
1150 Q$ = "" : INPUT "Do you want instructions "; Q$
1160 IF LEFT$(Q$,1) = "y" OR LEFT$(Q$,1) = "n" THEN PRINT "Please change
     to upper case input, using the double arrow key." : GOTO 1150
1170 IF Q$ <> "YES" AND Q$ <> "NO" THEN 4430
1180 IF Q$ = "YES" THEN GOSUB 4460
1190 DF = 2 : Q$ = ""
1200 INPUT "Do you want a difficult game "; Q$
1210 IF Q$ <> "YES" AND Q$ <> "NO" THEN GOTO 4450
1220 IF Q$ = "YES" THEN DF = 1
1230 Q5 = -1 : INPUT "Klingon mobility (0-100) "; Q5
1240 Q5 = Q5/100 : IF Q5 >= 0 AND Q5 <= 1 THEN 1260
1250 PRINT "Please concentrate !" : GOTO 1230
1260 GOSUB 4380 : PRINT "Entering galaxy ";
1270 PRINT INT(RND(1)*100000!)
1280 D = 60+INT(RND(1)*10) : D9 = D
1290 B = DF*2+INT(RND(1)*3) : B9 = B
1300 K = (3-DF)*14+INT(RND(1)*10) : K9 = K
1310 C = 85+DF*20+INT(RND(1)*15) : C9 = C
1320 FOR I = 0 TO 7 : FOR J = 0 TO 7 : H(I,J) = 0
1330 A(I,J) = INT(RND(1)*4*(3-DF)) : NEXT : NEXT
1340 FOR I = 1 TO B : GOSUB 1930
1350 A(X1,Y1) = A(X1,Y1)+10 : NEXT
1360 FOR I = 1 TO K : GOSUB 1930
1370 A(X1,Y1) = A(X1,Y1)+100 : NEXT
1380 S9 = 3000+INT(RND(1)*1000)
1390 F8 = 0 : F7 = 0 : GOSUB 1900
1400 IF F < K THEN F = K+INT(RND(1)*5)
1410 PRINT "Stardate";S9
1420 PRINT "Captain ";N$;":"
1430 PRINT "Your mission is to destroy";K;
1440 PRINT "Klingons in";D;"stardates."
1450 PRINT "You have a crew of";C
1460 PRINT "There are";B;"starbases in this galaxy."
1470 PRINT "You have";F;"photon torpedoes."
1480 GOSUB 1930 : U = X1 : V = Y1
1490 GOSUB 1930 : X = X1 : Y = Y1
1500 FOR I = 0 TO 7 : FOR J = 0 TO 7 : S$(I,J) = X$
1510 NEXT : NEXT
1520 S$(X,Y) = E$ : O = 0
1530 GOSUB 4580
1540 IF M1 = 0 THEN 1570
1550 I$ = K$ : FOR I = 0 TO M1-1 : GOSUB 1940 : KP(I) = 300
1560 KX(I) = X1 : KY(I) = Y1 : NEXT
1570 KP(M1) = M9
1580 IF M2 > 0 THEN I$ = B$ : FOR I = 1 TO M2 : GOSUB 1940 : NEXT
1590 IF M3 > 0 THEN I$ = S$ : FOR I = 1 TO M3 : GOSUB 1940 : NEXT
1600 GOSUB 1820
1610 GOSUB 5550 : GOSUB 2670
1620 IF D = 0 THEN 4930
1630 IF E <= 0 THEN 4950
1640 IF E > 10000 THEN E = 6000
1650 IF C = 0 THEN 4970
1660 Q$ = "" : PRINT "Captain ";N$;"! Command ? ";
1670 I7 = 4 : GOTO 5450
1680 Q$ = Q1$
1690 IF Q$ = "H" OR Q$ = "HELP" THEN 5050
1700 IF Q$ = "R" THEN 3130
1710 IF Q$ = "S" THEN 2230
1720 IF Q$ = "W" THEN 3350
1730 IF Q$ = "L" THEN 2100
1740 IF Q$ = "P" THEN 2340
1750 IF Q$ = "T" THEN 3850
1760 IF Q$ = "G" THEN 1990
1770 IF Q$ = "D" THEN 3290
1780 IF Q$ = "A" THEN 4980
1790 IF Q$ = "" THEN 1660
1800 PRINT "Captain, please give a valid order!"
1810 D1 = .05 : GOSUB 5230 : GOTO 1620
1820 FOR I = X+(X>0) TO X-(X<7)
1830 FOR J = Y+(Y>0) TO Y-(Y<7)
1840 IF S$(I,J) = B$ THEN 1860
1850 NEXT : NEXT : O = 0 : RETURN
1860 IF O = 1 THEN RETURN
1870 GOSUB 1900
1880 PRINT "Sulu : Captain, we are docked at the starbase."
1890 O = 1 : RETURN
1900 IF E > 10000 OR E < 6000 THEN E = 6000
1910 IF F < 15 THEN F = 15
1920 FOR I = 0 TO 6 : D(I) = 0 : NEXT : RETURN
1930 X1 = INT(RND(1)*8) : Y1 = INT(RND(1)*8) : RETURN
1940 X1 = INT(RND(1)*8) : Y1 = INT(RND(1)*8)
1950 IF S$(X1,Y1) <> X$ THEN 1940
1960 S$(X1,Y1) = I$ : RETURN
1970 PRINT "Enterprise is at Quadrant";U;V;"  Sector";X;Y
1980 RETURN
1990 GOSUB 4380 : PRINT "Galactic record display:
     (Klingons, Starbases, Stars)"
2000 GOSUB 1970 : J5 = 1 : GOSUB 3030
2010 IF I5 > 0 THEN 1810
2020 PRINT : PRINT "       0    1    2    3    4    5    6    7" : PRINT
2030 FOR I = 0 TO 7 : PRINT "          ";I;": ";
2040 FOR J = 0 TO 7
2050 IF H(I,J) = 0 THEN PRINT G$; : GOTO 2070
2060 PRINT RIGHT$("    "+STR$(G(I,J)),5);
2070 NEXT : PRINT : NEXT
2080 PRINT
2090 D1 = .6 : GOSUB 5230 : GOTO 1620
2100 GOSUB 4380 : PRINT "Long range scan:";
2110 PRINT " (Klingons, Starbases, Stars)"
2120 GOSUB 1970 : J5 = 2 : GOSUB 3030
```

PROGRAMS

```
2130 IF I5 > 0 THEN 1810
2140 PRINT
2150 PRINT "                    ";V-1;"   ";V;"   ";V+1 : PRINT
2160 FOR I = U-1 TO U+1 : PRINT "          ";I;": ";
2170 FOR J = V-1 TO V+1
2180 IF I < 0 OR I > 7 OR J < 0 OR J > 7 THEN PRINT L$; : GOTO 2210
2190 PRINT RIGHT$("    "+STR$(A(I,J)),6);
2200 H(I,J) = 1 : G(I,J) = A(I,J)
2210 NEXT : PRINT : NEXT : PRINT
2220 D1 = .1 : GOSUB 5230 : E = E-20 : GOTO 1620
2230 GOSUB 4380 : PRINT "Short range scan:"
2240 GOSUB 1970 : J5 = 0 : GOSUB 3030
2250 PRINT
2260 IF I5 > 0 THEN 1810
2270 H(U,V) = 1 : G(U,V) = A(U,V)
2280 PRINT "                  0  1  2  3  4  5  6  7"
2290 FOR I = 0 TO 7 : PRINT "                  ";I;
2300 FOR J = 0 TO 7 : PRINT "  ";S$(I,J); : NEXT : PRINT
2310 NEXT
2320 PRINT
2330 D1 = .1 : GOSUB 5230 : E = E-10 : GOTO 1620
2340 J5 = 3 : GOSUB 3030 : IF I5 > 0 THEN 1810
2350 A = 0
2360 PRINT "Phasor energised. How much energy ? ";
2370 I7 = 2 : GOTO 5450
2380 A = VAL(Q1$)
2390 A = INT(A) : IF A < 0 THEN 1800
2400 IF A = 0 THEN 1810
2410 IF A <= E THEN 2440
2420 PRINT "Spock: We only have";E;"units left."
2430 GOTO 1810
2440 E = E-A : IF M1 > 0 THEN 2480
2450 PRINT "Phasor fired, but no Klingons in the Quadrant."
2460 IF K = 0 THEN 4620
2470 D1 = .5 : GOSUB 5230 : GOTO 1610
2480 A = INT(A/M1)
2490 FOR M = 0 TO 62 : IF KP(M) = M9 THEN 2460
2500 IF KP(M) = 0 THEN 2530
2510 GOSUB 2540 : PRINT S;"units hit. ";
2520 GOSUB 2590
2530 NEXT : GOTO 2460
2540 IF A <= 1000 THEN 2570
2550 PRINT "Dilithium crystals overloaded."
2560 J5 = 3 : D(J5) = D(J5)+1 : GOSUB 3030 : A = 1000
2570 I = KX(M)-X : J = KY(M)-Y
2580 S = INT(A*30/(30+I*I+J*J)+1) : RETURN
2590 PRINT "Klingon ";CHR$(65+M);" at Sector";
2600 PRINT KX(M); KY(M);
2610 KP(M) = KP(M)-S
2620 IF KP(M) > 0 THEN PRINT "damaged." : RETURN
2630 KP(M) = 0 : K = K-1 : M1 = M1-1
2640 A(U,V) = A(U,V)-100 : G(U,V) = A(U,V)
2650 S$(KX(M),KY(M)) = X$
2660 PRINT "destroyed." : RETURN
2670 IF M1 = 0 THEN RETURN
2680 PRINT "Klingon attack!"
2690 IF O = 0 THEN 2810
2700 PRINT "Starbase shields the Enterprise, but it's under attack too!"
2710 IF RND(1) > .15*SQR(M1) THEN RETURN
2720 PRINT "*** BOOM ***"
2730 PRINT "Starbase destroyed!"
2740 B = B-1 : M2 = M2-1
2750 A(U,V) = A(U,V)-10 : G(U,V) = A(U,V)
2760 FOR I = X+(X>0) TO X-(X<7)
2770 FOR J = Y+(Y>0) TO Y-(Y<7)
2780 IF S$(I,J) = B$ THEN S$(I,J) = X$ : GOTO 2800
2790 NEXT : NEXT
2800 O = 0 : T = 200 : GOSUB 2940 : GOSUB 1820 : RETURN
2810 T = 0 : FOR M = 0 TO 62 : IF KP(M) = M9 THEN 2880
2820 IF KP(M) = 0 THEN 2870
2830 A = (KP(M)+KP(M)*RND(1))/2
2840 GOSUB 2540 : T = T+S
2850 PRINT S;"units hit from Klingon ";CHR$(65+M);
2860 PRINT " at Sector";KX(M);KY(M)
2870 NEXT
2880 E = E-T : IF E > 0 THEN 2910
2890 PRINT "*** BANG ***"
2900 FOR I = 1 TO 500 : NEXT : RETURN
2910 PRINT E;"energy units left."
2920 IF (E*RND(1)/6) < T THEN 2940
2930 PRINT "No damage." : RETURN
2940 IF D(6) > 0 THEN 2980
2950 D(6) = INT(RND(1)*T/75) : J5 = 6 : GOSUB 3030
2960 IF I5 > 0 THEN 2980
2970 PRINT "Shields prevented damage." : RETURN
2980 J5 = INT(RND(1)*6)
2990 D(J5) = D(J5)+INT(RND(1)*T/100)+1
3000 I6 = INT(RND(1)*T/50) : IF I6 = 0 THEN 3030
3010 C = C-I6 : IF C < 0 THEN I6 = C : C = 0
3020 PRINT "McCoy: Sickbay here, we had";I6;"casualties."
3030 I5 = D(J5) : IF I5 = 0 THEN RETURN
3040 IF J5 = 0 THEN PRINT "Short range sensor";
3050 IF J5 = 1 THEN PRINT "Galactic record display";
3060 IF J5 = 2 THEN PRINT "Long range sensor";
3070 IF J5 = 3 THEN PRINT "Phasor";
3080 IF J5 = 4 THEN PRINT "Warp engines";
3090 IF J5 = 5 THEN PRINT "Photon torpedo tubes";
3100 IF J5 = 6 THEN PRINT "Shields";
3110 PRINT " damaged." : PRINT I5;"stardates estimated for repair."
3120 RETURN
3130 GOSUB 4380 : PRINT "Status report:"
3140 PRINT "Stardate";FNR(S9+D9-D)
3150 PRINT "Captain ";N$;" in command."
3160 PRINT FNR(D9-D);"stardates used, and ";D;" stardates left."
3170 GOSUB 1970
3180 IF O = 1 THEN PRINT "Docked at starbase."
3190 IF M1 > 0 THEN PRINT "*** Condition RED ***";
3200 IF M1 > 0 THEN PRINT M1;"Klingons in quadrant."
3210 IF M1 = 0 THEN PRINT "Condition Green."
3220 IF E < 1000 THEN PRINT "*** Energy dangerously low ***"
```


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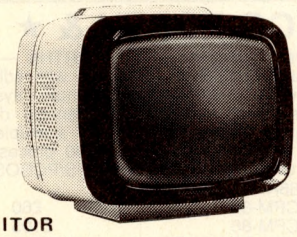
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PROGRAMS

```
3230 PRINT E;"energy units left."
3240 PRINT C;"crew."
3250 PRINT B;"starbases."
3260 PRINT F;"photon torpedoes."
3270 PRINT K;"Klingons left to destroy."
3280 D1 =.1 : GOSUB 5230 : GOTO 1620
3290 GOSUB 4380 : PRINT "Damage report:"
3300 A = 0 : FOR J5 = 0 TO 6
3310 GOSUB 3030 : IF I5 > 0 THEN A = 1
3320 NEXT : IF A > 0 THEN 3280
3330 PRINT : PRINT "All systems functioning."
3340 PRINT : GOTO 3280
3350 J5 = 4 : GOSUB 3030
3360 IF I5 > 0 THEN PRINT "Impulse engines only."
3370 W= 0 : PRINT "Warp factor (in sectors) ? ";
3380 I7 = 1 : GOTO 5450
3390 W = VAL(Q1$)
3400 IF W < 0 THEN 1800
3410 IF W < 1 THEN 1810
3420 IF W <= 3 OR I5 = 0 THEN 3450
3430 PRINT "Chekov: We can try 3 at the most."
3440 GOTO 3370
3450 IF W < 91 THEN 3480
3460 PRINT "Spock: Are you sure, Captain ?"
3470 GOTO 3370
3480 IF E >= INT(W*20) THEN 3520
3490 PRINT "Scott: Insufficient energy, Captain."
3500 PRINT "Maximum warp factor possible now is";INT(E/20)
3510 GOTO 3370
3520 GOSUB 4260 : IF R = 0 THEN 1810
3530 D1 = 1 : GOSUB 5230 : E = E-INT(W*20)
3540 S$(X,Y) = X$ : P = X : G = Y : I = X : J = Y : Z = 0
3550 IF W < (R/2) THEN 3680
3560 W = W-R : O = 0
3570 P = P+S : G = G+T : I = INT(P+.5) : J = INT(G+.5)
3580 IF I < 0 THEN Z = 1 : U = U-1 : P = P+8 : I = 7
3590 IF I > 7 THEN Z = 1 : U = U+1 : P = P-8 : I = 0
3600 IF J < 0 THEN Z = 1 : V = V-1 : G = G+8 : J = 7
3610 IF J > 7 THEN Z = 1 : V = V+1 : G = G-8 : J = 0
3620 IF Z <> 0 THEN 3550
3630 IF S$(I,J) = X$ THEN X = I : Y = J : GOTO 3550
3640 PRINT "*** EMERGENCY STOP ***"
3650 T = 500 : GOSUB 2940
3660 S$(X,Y) = E$
3670 GOSUB 1970 : GOSUB 1820 : GOTO 1610
3680 IF Z = 0 THEN X = I : Y = J :GOTO 3660
3690 IF RND(1) > .1 THEN 3720
3700 PRINT "*** SPACE STORM ***"
3710 T = 300 : GOSUB 2940
3720 IF RND(1) > .1 THEN 3770
3730 PRINT "You have plunged into a rotating black hole! Energy gain of";
3740 A = INT(RND(1)*3000) : E = E+A : PRINT A;"units."
3750 PRINT "Ship hurtles through space warp!"
3760 PRINT "Position unknown." : GOTO 1480
3770 IF U < 0 OR U > 7 OR V < 0 OR V > 7 THEN 3790
3780 X = I : Y = J :GOSUB 1970 : GOTO 1500
3790 PRINT "You have attempted to leave the galaxy.
     Curved space prevented this."
3800 IF U < 0 THEN U = 0
3810 IF U > 7 THEN U = 7
3820 IF V < 0 THEN V = 0
3830 IF V > 7 THEN V = 7
3840 GOTO 3780
3850 J5 = 5 : GOSUB 3030 : IF I5 > 0 GOTO 1810
3860 IF F > 0 THEN 3890
3870 PRINT "Chekov: No torpedoes left!"
3880 GOTO 1810
3890 PRINT "Photon torpedo loaded. ";
3900 GOSUB 4260 : IF R = 0 THEN 1810
3910 F = F-1 : F8 = F8+1 : F7 = F7+1
3920 PRINT "Tracking...";
3930 P = X : G = Y
3940 P = P+S : G = G+T : I = INT(P+.5) : J = INT(G+.5)
3950 IF I < 0 OR I > 7 OR J < 0 OR J > 7 THEN 4030
3960 PRINT "  ";MID$(STR$(I),2,1);"-";
3970 PRINT MID$(STR$(J),2,1);
3980 IF S$(I,J) = X$ THEN 3940
3990 PRINT
4000 IF S$(I,J) = K$ THEN 4060
4010 IF S$(I,J) = B$ THEN 4110
4020 IF S$(I,J) = S$ THEN 4160
4030 PRINT : PRINT "It missed."
4040 IF K = 0 THEN 4620
4050 D1 = .5 : GOSUB 5230 : E = E-20 : GOSUB 1820 : GOTO 1610
4060 F7 = F7-1 : S = INT(250+RND(1)*200)
4070 FOR M = 0 TO 62 : IF KP(M) = 0 THEN 4100
4080 IF KX(M) <> I OR KY(M) <> J THEN 4100
4090 GOSUB 2590 : GOTO 4040
4100 NEXT
4110 B = B-1 : M2 = M2-1
4120 A(U,V) = A(U,V)-10 : G(U,V) = A(U,V)
4130 S$(I,J) = X$
4140 PRINT "Starbase destroyed."
4150 PRINT "Spock: Fascinating, Captain!" : GOTO 4040
4160 PRINT "It hit a star."
4170 IF RND(1) > .3 THEN 4200
4180 PRINT "Photon torpedo absorbed by star."
4190 GOTO 4040
4200 M3 = M3-1 : A(U,V) = A(U,V)-1 : G(U,V) = A(U,V)
4210 S$(I,J) = X$ : PRINT "Star destroyed."
4220 IF RND(1) > .5 THEN 4040
4230 PRINT "It went nova!"
4240 PRINT "*** Radiation alarm ***"
4250 T = 300 : GOSUB 2940 : GOTO 4040
4260 I = 0 : PRINT "Course (0-360) ? ";
4270 I7 = 1 : GOTO 5450
4280 I = VAL(Q1$)
4290 IF I >= 0 AND I <= 360 THEN 4310
4300 R = 0 : RETURN
4310 S = INT((I+45)/90) : I = TAN((I-S*90)*PI/180)
```

PROGRAMS



PET AREAS

by John Guy

'Areas' is an educational program for a 32k PET. It is intended to help children in the 7-12 years age group learn the methods of calculating areas of squares, rectangles and triangles.

Firstly, the program demonstrates the methods of calculation and, secondly, invites the user to attempt ten example problems. Once all ten have been attempted, the program gives a score and gives the user a second attempt at the ones he got wrong the first time. The correct solutions are then presented.

Following each of the three sections, a revision option is offered. Some of the wording will have to be changed for younger children, but the program as a whole should be useful to a fairly wide age range. There is a spelling mistake, incidentally, in line 4600 which needs to be corrected.

```
AREAS OF SIMPLE SHAPES
      BY
   JOHN GUY

1000 REM AREAS OF SIMPLE SHAPES
1010 REM   BY.    JOHN GUY......
1020 REM
1030 OPEN 1,0:PRINT"■":DIMQUE(10,2):REP=0
1050 PRINT"■■■   ▒▒▒ ▒▒▒ ▒▒▒ ▒▒▒  ▒▒▒"
1060 PRINT "    ▒ ▒ ▒ ▒   ▒ ▒  ▒  "
1070 PRINT"    ▒▒▒ ▒▒▒ ▒▒▒  ▒▒▒ ▒▒▒"
1080 PRINT"    ▒ ▒ ▒▒▒ ▒   ▒▒  ▒"
1090 PRINT"    ▒ ▒ ▒ ▒ ▒▒▒ ▒ ▒  ▒▒▒"
1100 PRINT"■   ■OF SIMPLE SHAPES■"
1110 PRINT"■■■              BY"
1120 PRINT"                JOHN.GUY"
1130 FOR DELAY=1 TO 5000:NEXT DELAY
1140 REM  AREAS OF SQUARES                          :REM AREAS OF SQUARES
1150 WIN$="■■■■■■■■■■■■■■■■■■■■"
1160 PRINT"■          ■AREAS OF SQUARES■"
1170 GOSUB 1670                                     :REM FIRST SQUARE
1180 PRINTWIN$;"TO FIND THE AREA OF THE SQUARE ABOVE WE"
1190 PRINT"FIRST DIVIDE THE MAIN SQUARE INTO A"
1200 PRINT"NUMBER OF SMALLER SQUARES EACH 1 SQ UNIT";
1210 PRINT"IN AREA   IE.EACH SIDE OF THE LITTLE"
1220 PRINT"SQUARE IS 1 UNIT LONG."
1230 GOSUB 1760                                     :REM FILL SQUARE
1240 PRINTWIN$;"■■■■■■";
1250 PRINT"NOW WE COUNT THE NUMBER OF LITTLE"
1260 PRINT"SQUARES."
1270 GOSUB 1840                                     :REM COUNT SQUARES
1280 PRINTWIN$;"■■■■■■■■    ■PRESS A KEY TO CONTINUE■"
1290 GET KEY$:IF KEY$="" THEN 1290
1300 GOSUB 2120                                     :REM CLEAR TEXT WINDOW
1310 PRINTWIN$;"AS YOU CAN SEE THERE ARE 100 LITTLE"
1320 PRINT"SQUARES INSIDE THE BIG SQUARE."
1330 PRINT"    WE SAY THAT THE AREA OF THE BIG"
1340 PRINT"SQUARE IS ■100 SQ UNITS■"
1350 PRINT"■    ■PRESS A KEY TO CONTINUE■"
1360 GET KEY$:IF KEY$="" THEN 1360
1370 PRINT"■          ■AREAS OF SQUARES■"
1380 GOSUB 1780                                     :REM FILL SQUARE
1390 PRINT"■■■■■■■■■■■■■■■■■■■10"
1400 PRINT"■■■■■■■■■■■■■■■10"
1410 PRINTWIN$;"IF YOU LOOK AT THE SQUARE AGAIN YOU WILL";
1420 PRINT"SEE THAT THE 100 SQUARES ARE ARANGED"
1430 PRINT"INTO 10 ROWS OF 10 SQUARES"
1440 PRINT"    THEREFORE WE CAN SAY"
1450 PRINT"■      AREA = 10 X 10"
1460 PRINT"            = 100 SQ UNITS
1470 PRINT"■    ■PRESS A KEY TO CONTINUE"
1480 GET KEY$:IF KEY$="" THEN 1480
1490 GOSUB 2120                                     :REM CLEAR TEXT WINDOW
1500 PRINTWIN$;"          ■UNITS■"
1510 PRINT"IF EACH LITTLE SQUARE IS OF SIDE 1CM"
1520 PRINT"■THEN THE AREA OF EACH LITTLE SQUARE"
1530 PRINT"■ IS  1CM■2■"
1540 PRINT"■UNIT FOR ■ALL■ AREAS IS UNITS■2"
1550 PRINT"■    ■PRESS A KEY TO CONTINUE■"
1560 GET KEY$:IF KEY$="" THEN 1560
1570 PRINT"■          ■AREAS OF SQUARES■"
1580 GOSUB 2030                                     :REM SQUARE OF SIDE B
1590 PRINTWIN$;"     GENERAL FORMULA"
1600 PRINT"■ IF WE HAVE A SQUARE OF SIDE B CM"
1610 PRINT"THEN AREA = B X B"
1620 PRINT"■■          = B■2■ CM■2■"
1630 PRINT"            ———— "
1640 PRINT"    ■PRESS A KEY TO CONTINUE■"
1650 GET KEY$:IF KEY$="" THEN 1650
1660 GOTO 2180                                      :REM TEST SECTION
1670 REM  FIRST SQUARE                              :REM FIRST SQUARE
1680 PRINT"■■■■          ┌———————┐"
1690 FOR A=1 TO 8
1700 PRINT"              |       |"
1710 NEXT A
1720 PRINT"              └———————┘"
1730 PRINT"■■■             10"
1740 PRINT"■■■■■       10
1750 RETURN
1760 REM  FILL  SQUARE                              :REM FILL SQUARE
1770 FOR A=1 TO 8000:NEXTA
1780 PRINT"■■■■";:FOR A=1 TO 10
1800 PRINT"■■■■■■■■■■■■┌┬┬┬┬┬┬┬┬┐ "
1810 NEXT A
1820 PRINT"              ————————"
1830 RETURN
1840 REM  COUNT SQUARES                             :REM COUNT SQUARES
1850 FOR DELAY=1TO3000:NEXT DELAY
1860 PRINT"■■■■";: COUNT=0
1890 FOR A=1TO10:FOR B=1TO10:PRINT"■■■■■■■■■■■■■■";
1900 FORX=1TOA:PRINT"■";:NEXT X
1930 FOR Y=1TOB:PRINT"■";:NEXT Y:PRINT"■■■":COUNT=COUNT+1
1980 PRINT"■■■"TAB(28)"COUNT=";COUNT
1990 FOR DELAY=1TO90:NEXT DELAY:NEXT B:NEXT A:RETURN
2030 REM  SQUARE OF SIDE B                          :REM SQUARE OF SIDE B
2040 PRINT"■■■             B "
2050 PRINT"■■■■■       B"
2060 PRINT"■■■■          ┌———————┐"
2070 FOR A=1TO8
2080 PRINT"■■■■■■■■■■■■■          |"
2090 NEXT A
```


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PROGRAMS

```
2100 PRINT"                └──────────┘"
2110 RETURN
2120 REM CLEAR TEXT WINDOW                              :REM CLEAR TEXT WINDOW
2130 PRINTWIN$;"■";
2140 FORA=1TO9
2150 PRINT"
2160 NEXTA
2170 RETURN
2180 REM  TEST SECTION                                  :REM TEST SECTION
2190 FOR TEST=1TO10
2200 PRINT"■        ■AREAS OF SQUARES■"
2210 PRINT"                ■TEST■"
2220 GOSUB 2060                                         :REM SQUARE
2230 SIDE=INT(RND(1)*10)+1
2235 IF REP=1 THEN RETURN
2240 PRINT"■■■                "SIDE
2250 PRINT"■■■■■      "SIDE
2260 PRINTWIN$;"■QUESTION NUMBER"TEST"■"
2270 PRINT"■■■HAT IS THE AREA OF THE SQUARE"
2280 PRINT"ABOVE? ";:INPUT#1,AREA$
2290 AREA=VAL(AREA$)
2300 IF AREA=0 THEN 2260
2305 IF REP=1 THEN RETURN
2310 IF AREA=(SIDE*SIDE)THEN PRINT"         ■CORRECT■":SC=SC+1:QUE(TEST,1)=0
2315 IF AREA=(SIDE*SIDE) THEN 2330
2320 PRINT"         ■WRONG■":QUE(TEST,1)=SIDE
2330 FOR DELAY=1TO1000:NEXTDELAY
2340 NEXT TEST
2370 PRINT"■        ■AREAS OF SQUARES■"
2380 PRINT"                ■TEST■"
2390 PRINT"■■■ OUT OF 10 QUESTIONS YOU ANSWERED"
2400 PRINTSC;" QUESTIONS CORRECTLY"
2410 PRINT"■■■YOU WILL NOW HAVE ANOTHER CHANCE TO"
2420 PRINT"ANSWER THE QUESTIONS YOU GOT WRONG IN"
2430 PRINT"THE TEST.IF YOU GET THE QUESTIONS"
2440 PRINT"WRONG AGAIN YOU WILL BE GIVEN THE"
2450 PRINT"CORRECT ANSWER"
2460 PRINT"■■■    ■PRESS A KEY TO CONTINUE■"
2470 GET KEY$:IF KEY$="" THEN 2470
2475 REP=1
2480 FOR TEST=1 TO 10
2490 IF QUE(TEST,1)=0 THEN 2580
2500 GOSUB 2200
2510 SIDE=QUE(TEST,1):GOSUB 2240
2520 GOSUB 3560                                         :REM CLEAR TEXT WINDOW
2530 IF AREA=(SIDE*SIDE) THENPRINTWIN$;AREA;" IS THE CORRECT ANSWER":GOTO 2560
2540 IF AREA<>(SIDE*SIDE) THEN PRINTWIN$;AREA;" IS THE WRONG ANSWER"
2550 PRINT"THE CORRECT ANSWER IS";SIDE*SIDE
2560 PRINT"■■    ■PRESS A KEY TO CONTINUE■"
2570 GET KEY$:IF KEY$="" THEN 2570
2580 NEXT TEST
2590 REP=0
2630 PRINT"■■DO YOU WISH TO REVISE (Y/N)■"
2640 GET KEY$:IF KEY$=""THEN2640
2650 IF KEY$="Y" THEN 1160                              :REM START OF LESSON
2660 IF KEY$="N" THEN 2680                              :REM NEXT LESSON
2670 GOTO 2640
2680 REM      NEXT LESSON                               :REM NEXT LESSON
2690 REM  AREAS OF RECTANGLES                           :REM AREAS OF RECTANGLES
2700 WIN$="■■■■■■■■■■■■■■■■■■■■"
2710 PRINT"■          ■AREAS OF RECTANGLES■"
2720 GOSUB 3120                                         :REM FIRST RECTANGLE
2730 PRINTWIN$;"IF WE DIVIDE THE RECTANGLE INTO A"
2740 PRINT"NUMBER OF SMALL SQUARES EACH OF"
2750 PRINT"■AREA 1 CM■2■"
2760 GOSUB 3210                                         :REM FILL RECTANGLE
2770 PRINTWIN$;"■■■■";
2780 PRINT"WE CAN COUNT THE NUMBER OF SQUARES."
2790 PRINT"FROM THIS WE CAN GET THE AREA"
2800 GOSUB 3290                                         :REM COUNT SQUARES
2810 PRINTWIN$;"■■■■■■■■    ■PRESS A KEY TO CONTINUE■"
2820 GET KEY$:IF KEY$="" THEN 2820
2830 GOSUB 3560                                         :REM CLEAR TEXT WINDOW
2840 PRINTWIN$;"IN THIS RECTANGLE THERE ARE 40 SMALL"
2850 PRINT"SQUARES. THIS MEANS THAT THE AREA IS"
2860 PRINT"■40 CM■2■"
2870 PRINT"■■    ■PRESS A KEY TO CONTINUE■"
2880 GET KEY$:IF KEY$="" THEN 2880
2890 PRINT"■          ■AREAS OF RECTANGLES■"
2900 GOSUB 3230                                         :REM FILL RECTANGLE
2910 PRINT"■■■■■              10"
2920 PRINT"■■■       4"
2930 PRINTWIN$;"IF YOU LOOK AT THE RECTANGLE AGAIN"
2940 PRINT"YOU WILL SEE THAT THE SQUARES"
2950 PRINT"ARE ARRANGED IN 4 ROWS OF 10 SQUARES"
2960 PRINT"THERFORE WE CAN SAY THAT"
2970 PRINT"          AREA = 4 X 10
2980 PRINT"■               = 40 CM■2■"
2990 PRINT"                 "
3000 PRINT"    ■PRESS A KEY TO CONTINUE■"
3010 GET KEY$: IF KEY$="" THEN 3010
3020 PRINT"■          ■AREAS OF RECTANGLES■"
3030 GOSUB 3480                                         :REM RECTANGLE B BY C
3040 PRINTWIN$;"■■        ■GENERAL FORMULA■"
3050 PRINT"■FOR THIS RECTANGLE OF SIDES B UNITS  AND";
3060 PRINT"C UNITS"
3070 PRINT"■        AREA = B X C UNITS■2■"
3080 PRINT"                 "
3090 PRINT"    ■PRESS A KEY TO CONTINUE■"
3100 GET KEY$:IF KEY$="" THEN 3100
3110 GOTO  3620                                         :REM TEST SECTION
3120 REM FIRST RECTANGLE                                :REM FIRST RECTANGLE
3130 PRINT"■■■■■■■          ┌──────────┐"
3140 FOR A=1 TO 2
3150 PRINT"          │          │"
3160 NEXT A
3170 PRINT"          └──────────┘"
3180 PRINT"■■■■■              10 CM"
3190 PRINT"■■■    4 CM"
3200 RETURN
3210 REM FILL  RECTANGLE                                :REM FILL RECTANGLE
3220 FOR DELAY=1 TO 8000:NEXT DELAY
3230 PRINT"■■■■■■■";
3240 FOR A=1 TO 4
3250 PRINT"▌▌▌▌▌▌▌▌▌▌▐▐▐▐▐▐▐▐▐▐ "
3260 NEXT A
3270 PRINT"          ──────────"
3280 RETURN
3290 REM COUNT SQUARES                                  :REM COUNT SQUARES
3300 FOR DELAY=1 TO 3000:NEXT DELAY
3310 PRINT"■■■■■■■";:COUNT=0
3340 FOR A=1 TO 4:FOR B=1 TO 10:PRINT"■■■■■■■■■■■■■■■■■■■■";
3350 FORX=1 TO A:PRINT"■";:NEXT X
3380 FOR Y=1 TO B:PRINT"■";:NEXT Y
3410 PRINT"■■":COUNT=COUNT+1:PRINT"■■■"TAB(28)"COUNT=";COUNT
3440 FOR DELAY=1TO90:NEXTDELAY:NEXT B:NEXT A:RETURN
3480 REM RECTANGLE B BY C                               :REM RECTANGLE B BY C
3490 PRINT"■■■■■              B"
3500 PRINT"■■■       C"
3510 PRINT"■■■■■■■          ┌──────────┐"
```

PROGRAMS

```
3520 FOR A=1 TO 2
3530 PRINT"■■■
```

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PROGRAMS

```
4860 PRINT"   10 CM ┌┬┬┬┬┐ (HYPOTENUSE)"
4870 PRINT"         ┌┬┬┬┬┐"
4880 PRINT"         ┌┬┬┬┬┐"
4890 PRINT"         ┌┬┬┬┬┐"
4900 PRINT"         ┌┬┬┬┬┐"
4910 PRINT"         ┌┬┬┬┬┐"
4920 PRINT"         └┴┴┴┴┘"
4930 PRINT"           10 CM"
4940 PRINT"         (BASE)":RETURN
4960 REM MAKE SQUARES                                   :REM MAKE SQUARES
4970 FOR DELAY=1 TO 5000: NEXT DELAY
4980 PRINT"■■■         ┌┐"
4990 PRINT"▐▐▐▐▐▐▐▐▐▐▐▐▐ "
5000 PRINT"▐▐▐▐▐▐▐▐▐▐▐▐▐┐"
5010 PRINT"▐▐▐▐▐▐▐▐▐▐▐▐▐ "
5020 PRINT"▐▐▐▐▐▐▐▐▐▐▐▐▐┐"
5030 PRINT"▐▐▐▐▐▐▐▐▐▐▐▐▐ "
5040 PRINT"▐▐▐▐▐▐▐▐▐▐▐▐▐┐"
5050 PRINT"▐▐▐▐▐▐▐▐▐▐▐▐▐ "
5060 PRINT"▐▐▐▐▐▐▐▐▐▐▐▐▐┐"
5070 PRINT"▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐ ■■ ┐":RETURN
5090 REM COUNT SQUARES                                  :REM COUNT SQUARES
5100 COUNT=0:TRI$="■┌┬┬┬┬┬┬┬┬┬┬┐"
5110 FOR A=1 TO 10 STEP 2:FOR B=1 TO 2:FOR X=1 TO A
5140 PRINT"■■■■■■■■■■■■■";:FOR Y=1 TO A:PRINT "■";
5180 NEXT Y:IF B=1 THEN PRINT"┐";
5190 PRINTLEFT$(TRI$,X+1):FOR DELAY=1 TO 120:NEXT DELAY
5220 COUNT=COUNT+1:PRINT"■■■"TAB(28)"COUNT="COUNT
5230 NEXT X:NEXT B:NEXT A:RETURN
5270 REM GENERAL TRIANGLE                               :REM GENERAL TRIANGLE
5280 PRINT"■■■        VERTEX   "
5290 PRINT"             ^      "
5300 PRINT"            / \   I "
5310 PRINT"           /   \  I "
5320 PRINT"          /     \  H(PERP HEIGHT) "
5330 PRINT"         /       \ I "
5340 PRINT"        /  (BASE)  \I "
5350 PRINT"       ┴┴┴┴┴┴┴┴┴┴┴┴ "
5360 PRINT"           B ":RETURN
5380 REM CLEAR TEXT WINDOW                              :REM CLEAR TEXT WINDOW
5390 PRINTWIN$;"┐";:FOR A=1 TO 10
5410 PRINT"                                          ";
5420 NEXT A:RETURN
5440 REM TRIANGLE+SQUARE                                :REM TRIANGLE + SQUARE
5450 PRINT"■■■        ┌┬┬┬┬┬┬┬┬┐"
5460 PRINT"           \         | "
5470 PRINT"           |\        | "
5480 PRINT"           | \       | "
5490 PRINT"           |  \      | "
5500 PRINT"   10 CM   |   \     | "
5510 PRINT"           |    \    | "
5520 PRINT"           |     \   | "
5530 PRINT"           |      \  | "
5540 PRINT"           |       \ | "
5550 PRINT"           └┴┴┴┴┴┴┴┘ "
5560 PRINT"                    ":RETURN
5580 REM TRIANGLE                                       :REM TRIANGLE
5590 PRINT"■■■     ┌┬┬┬┬┬┬┬┬┐/"
5600 PRINT"        |         |/"
5610 PRINT"        |        /|"
5620 PRINT"        |      /  |"
5630 PRINT"        |    /    |"
5640 PRINT"        |  /      |"
5650 PRINT"        └┴┴┴┴┴┴┴┴┘":RETURN
5670 REM TEST SECTION                                   :REM TEST SECTION
5680 SC=0:FOR TEST=1 TO 10
5690 PRINT"┐          ■REAS OF TRIANGLES■"
5700 PRINT"                  ■TEST■"
5710 GOSUB 5580                                         :REM TRIANGLE
5715 IF REP=1 THEN RETURN
5720 B=INT(RND(1)*10)+1
5730 H=INT(RND(1)*10)+1
5735 IF REP=1 THEN RETURN
5740 PRINT"■■■■■■■■■H
5750 PRINT"■■■■■■■■B"CM"
5760 PRINTWIN$;"■UESTION NUMBER ";TEST;"■"
5770 PRINT"■■WHAT IS THE AREA OF THE TRIANGLE"
5780 PRINT"ABOVE? ";:INPUT#1,AREA$
5790 AREA=VAL(AREA$)
5795 IF REP=1 THEN RETURN
5800 IF AREA=0 THEN 5760
5810 IF AREA=(0.5*(B*H)) THEN PRINT"      ■CORRECT■":SC=SC+1
5815 IF AREA=(0.5*(B*H))THEN QUE(TEST,1)=0:GOTO 5830
5820 PRINT "          ■RONG■":QUE(TEST,1)=B:QUE(TEST,2)=H
5830 FOR DELAY=1 TO 1000:NEXT DELAY
5840 NEXT TEST
5850 PRINT"┐          ■REAS OF TRIANGLES■"
5860 PRINT"                  ■TEST■"
5870 PRINT"■■■ OUT OF 10 QUESTIONS YOU ANSWERED"
5880 PRINTSC;" QUESTIONS CORRECTLY"
5890 PRINT"■■■YOU WILL NOW HAVE ANOTHER CHANCE TO"
5900 PRINT"ANSWER THE QUESTIONS YOU GOT WRONG IN"
5910 PRINT"THE TEST.IF YOU GET THE QUESTIONS"
5920 PRINT"WRONG AGAIN YOU WILL BE GIVEN THE"
5930 PRINT"CORRECT ANSWER"
5940 PRINT"■■■    ■PRESS A KEY TO CONTINUE■"
5950 GET KEY$:IF KEY$="" THEN 5950
5960 REP=1
5970 FOR TEST=1 TO 10
5980 IF QUE(TEST,1)=0 THEN 6070
5990 GOSUB 5690
6000 B=QUE(TEST,1):H=QUE(TEST,2):GOSUB 5740
6010 GOSUB 3560                                         :REM CLEAR TEXT WINDOW
6020 IF AREA=(0.5*B*H) THENPRINTWIN$;AREA;" IS THE CORRECT ANSWER" GOTO 6070
6030 IF AREA<>(0.5*B*H) THEN PRINTWIN$;AREA;" IS THE WRONG ANSWER"
6040 PRINT"THE CORRECT ANSWER IS";0.5*B*H
6050 PRINT"■■    ■PRESS A KEY TO CONTINUE■"
6060 GET KEY$:IF KEY$="" THEN 6060
6070 NEXT TEST
6080 REP=0
6130 PRINT"■■DO YOU WISH TO REVISE (Y/N)■"
6140 GET KEY$:IF KEY$="" THEN 6140
6150 IF KEY$="Y" THEN 4190
6160 IF KEY$="N" THEN 6180
6170 GOTO 6140
6180 :REM END OF PROGRAM
6190 PRINT"┐        ■REAS OF SIMPLE SHAPES■"
6200 PRINT"■■■■YOU HAVE FINISHED THIS LESSON"
6210 PRINT"AND YOU HAVE FINISHED THIS PROGRAM"
6220 PRINT"■DO YOU WISH TO REVISE THE WHOLE"
6230 PRINT"PROGRAM ?"
6240 GET KEY$:IF KEY$="" THEN 6240
6250 IF KEY$="Y" THEN 4160
6260 IF KEY$="N" THEN 6280
6270 GOTO 6240
6280 PRINT"■■THANK-YOU FOR RUNNING THIS PROGRAM"
6290 PRINT"■AND I HOPE YOU HAVE BENEFITED FROM IT"
6300 PRINT"■■■       GOOD BYE"
6310 CLOSE1:END
READY.
```

PROGRAMS



ORIC FOREST OF DOOM

by S W Lucas

'Forest of Doom' is an adventure game for a 48k Oric 1.

The usual scenario: the prince of the realm has set out to recover four treasures stolen from his castle by a gang of evil villains. During this mission of danger and adventure, he has offended a passing witch and has been turned into something unpleasant.

Your good friend Arthur rushed out to rescue the prince, but fell ill along the way. Your task is to rescue Arthur and the prince, and to recover the stolen treasures, to wit: an antique orc dagger, a golden spear, a diamond-studded tiara and a ruby-encrusted goblet.

The program understands the following list of words:
N/S/E/W (as directions), SWIM, SHOOT, HIT, KILL, GET, TAKE, GRAB, DROP, LEAVE, HELP, PRAY, LOOK, EXAMINE, THROW, CHUCK, RUB, INSERT, USE, SORRY and a number of swear words (always useful!).

The program will accept the usual two-word combinations of verb and noun (for example, GET LAMP, SWIM RIVER). SCORE will tell you how well you're doing, and INVENTORY will tell you what you're carrying.

The author has supplied a number of clues which, being cruel and heartless, we're not going to publish until next month! This month you're on your own. Oh, alright, I'll give you one or two hints.

First, be warned: there are a number of red herrings! Objects which are of no use whatsoever and places which lead nowhere. There's a little girl in there somewhere with a liking for chocolate. Dwarfs like drinking, and goblins like dwarfs. The computer doesn't like being sworn at. Jack knows how to get over brick walls. Finally, if the computer tells you that you're completely lost, it's no use arguing. If you want any more clues, you'll have to wait until the next issue. Good luck!

```
  5 ZS=1:XX%=0
  15 REM WRITTEN BY S.W. LUCAS
 20 REM APRIL 1983
  30 GOSUB3110
  50 DIMO$(46),G$(42),S%(46,4),V$(3),B%(60,1),N$(60),N%(53),X$(61)
  60 A$="":P%=3:M%=0
  70 RESTORE:GOSUB440:GOSUB2410
  80 CLS
  110 PRINT"I AM "
  111 PRINTO$(P%):A$=""
  120 IFS%(P%,1)>0THENA$="NORTH"
  124 GOSUB3150
  140 IFS%(P%,2)>0ANDLEN(A$)>0THENA$=A$+",SOUTH"
  145 IFS%(P%,2)>0ANDLEN(A$)=0THENA$="SOUTH"
  150 IFS%(P%,3)>0ANDLEN(A$)>0 THENA$=A$+",EAST"
  155 IFS%(P%,3)>0ANDLEN(A$)=0THENA$="EAST"
  160 IFS%(P%,4)>0ANDLEN(A$)>0THENA$=A$+",WEST"
  170 IFS%(P%,4)>0ANDLEN(A$)=0THENA$="WEST"
  175 IFA%=6THENCLS:PAPER4:INK6:PRINT:PRINT:PRINT
  176 IFA%=6THENPRINT"YOU HAVE SUCCESSFULLY COMPLETED YOUR  MISSION":
PRINT:PRINT:PRINT:PRINT
  177 IFA%=6THENPRINT"WELL DONE"
  178 IFA%=6THEN ZAP:END
  185 PRINT:PRINT"I CAN GO ";A$
  190 IFP%=22ANDS%(22,3)=0THENPRINTX$(55)
  200 E=0:FORT=1TO37:PP%=0:IFB%(T,1)=P%THENPP%=1
  210 IFPP%=1THEN230
  220 NEXTT:GOTO250
  230 IFE=0THENPRINT"THAT LOOKS LIKE"
  235 PRINTG$(T):E=E+1:GOTO220
  250 PRINT:PRINT"WHAT SHOULD I DO NOW ";:INPUTZ$
  260 B$=LEFT$(Z$,1)
  270 CLS:PRINT"HOLD ON A SECOND"
  280 IFB$="N"ANDS%(P%,1)<>0THENP%=S%(P%,1):GOTO110
  290 IFB$="W"ANDS%(P%,4)<>0THENP%=S%(P%,4):GOTO110
  300 B$=LEFT$(Z$,2)
  310 IFB$="S"ANDMID$(Z$,2,1)<>"H"ANDS%(P%,2)<>0THENP%=S%(P%,2):GOTO1
10
  320 IFB$="SC"THENGOSUB3150:PRINT"YOU HAVE SCORED ";A%;" OUT OF 6":Z
AP:GOTO110
  321 IFB$="PU"THEN4500
  325 IFB$="E"ANDS%(P%,3)<>0ANDMID$(B$,2,1)<>"X"THENP%=S%(P%,3):GOTO1
10
  335 IFB$="GE"ORB$="TA"ORB$="GR"THEN1550
  338 IFB$="HE"THEN2390
  339 IFB$="SW"THENPRINT"I CAN'T SWIM":PAPER5:GOTO110
  350 IFB$="FU"ORB$="PI"ORB$="BU"THEN3210
  355 IFB$="DR"ORB$="LE"THEN1860
  370 IFB$="LO"THEN110
  375 IFB$="PR"THEN3260
  380 IFB$="SH"THEN2120
  390 IFB$="HI"THENEXPLODE:GOTO2120
  395 IFB$="KI"THENZAP:GOTO2120
  398 IFB$="EX"THEN2200
  400 IFB$="TH"ORB$="CH"THENZAP:GOTO2340
  405 IFB$="RU"THEN3280
  408 IFB$="IN"THEN2280
  409 IFB$="US"THEN2360
  410 K$=LEFT$(B$,1)
  414 IFK$<>"S"ANDK$<>"N"ANDK$<>"E"ANDK$<>"W"THENZS=0
  415 IFB$<>""ANDZS<>1THENPRINTX$(60):ZS=1
  420 GOTO110
```


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PROGRAMS

```
430 END
440 FORH=1TO46
445 FORD=1TO4
450 READS%(H,D)
455 NEXT
460 READQ$(H)
465 NEXT
470 FORH=1 TO37
480 READG$(H):READB%(H,1)
485 NEXT
490 FORH=1TO53
495 READN$(H),N%(H)
500 NEXT
507 RETURN
510 DATA0,0,2,0,"AT THE DOORWAY OF AN OLD HUT. THE DOORIS LOCKED"
520 DATA43,8,3,1,"IN A SHOP. THE SIGN SAYS 'DROP YOUR   TREASURES H
ERE'"
530 DATA0,9,4,2,"ON A DISUSED RAILWAY LINE"
550 DATA0,10,0,3,"ON A FOOTPATH LEADING INTO THE FOREST"~
560 DATA0,11,6,10,"AT A JUNCTION IN THE PATH"
565 DATA0,0,0,5,"AT A DEAD END"
570 DATA0,0,8,0,"BY A GATE. THE PAWNBROKER WON'T LEY   ME PASS"
590 DATA2,0,0,7,"BY THE DUSTBINS"
600 DATA3,0,0,0,"IN THE OLD TAVERN"
610 DATA4,0,0,0,"BY THE WOODS"
620 DATA5,0,16,0,"IN A SMALL THICKET"
630 DATA7,0,0,0,"IN A CLEARING FULL OF BROKEN POTS     WITH WEEDS E
VERYWHERE"
640 DATA0,0,14,12,"BY A SMALL PLOT OF LAND. IT IS RATHER OVERGROWN"
650 DATA0,18,0,13,"BY A GRAVE"
660 DATA0,19,0,0,"IN A SMALL OUTBUILDING"
670 DATA0,0,0,11,"AT A DEAD END"
680 DATA12,25,26,0,"IN A GLOOMY TUNNEL WI^H WATER POURING  DOWN THE
 WALLS"
690 DATA14,0,19,0,"ON A DISUSED TRACK"
700 DATA15,27,0,18,"AT THE ENTRANCE TO A TEMPLE"
710 DATA0,28,0,0,"IN A LAVATORY"
720 DATA16,0,0,0,"ON A NARROW BRIDGE OVER A STREEM."

730 DATA0,0,0,16,"IN A DARK PART OF THE FOREST"
740 DATA34,0,0,22,"IN A WORKSHOP"
750 DATA0,0,31,0,"IN A VAST HALL"
760 DATA17,0,42,0,"IN A TWISTY PASSAGE"
770 DATA0,42,0,17,"IN A LARGE HALL"
780 DATA19,0,0,0,"IN A TEMPLE"
790 DATA20,38,0,27,"IN A HOSPITAL"
800 DATA21,0,0,0,"AT A DEAD END"
810 DATA22,0,32,0,"IN A TINY SHRINE"
820 DATA32,0,0,24,"ON A BEACH"
830 DATA0,31,33,30,"IN A LARGE ARENA"
840 DATA36,37,0,32,"IN A HOUSE"
850 DATA0,23,0,0,"IN A TINY STOREROOM"
860 DATA41,41,41,34,"LOST"
870 DATA36,36,36,36,"COMPLETELY LOST"
880 DATA33,0,0,0,"IN A CELL"
890 DATA28,0,0,0,"IN A BROOM CUPBOARD"
900 DATA27,0,0,0,"IN A LONG NARROW TUNNEL"
910 DATA0,0,0,42,"IN AN ERIE CRYPT"
920 DATA41,41,41,35,"IN A FOG"
930 DATA26,0,0,25,"IN A CAVERN"
940 DATA0,2,45,44,"IN A POTTING SHED"
950 DATA0,0,43,0,"AT THE FAR END OF THE POTTING SHED"
960 DATA0,0,0,43,"BY A SMALL SHED"
970 DATA0,45,0,0,"IN THE SHED"
980 RETURN
990 DATA"A LARGE TOAD",14
1000 DATA"A LITTLE GIRL ",37
1010 DATA"A WALLET",30
1020 DATA"A FLASK OF BRANDY",9
1030 DATA"AN OLD DWARF",29
1040 DATA"A RUBY ENCRUSTED GOBLET",33
1050 DATA"A LOADED SHOTGUN",46
1060 DATA"A DIAMOND STUDDED TIARA ",41
1070 DATA"A  GENUINE ANTIQUE ORC DAGGER",38
1080 DATA"MY OLD FRIEND ARTHUR. HE LOOKS ILL",28
1090 DATA"A JAR OF DR. FRANKENSTEIN'S CURE ALL  MEDICINE",31
1100 DATA"A VENDING MACHINE. IT CONTAINS          CHOCOLATES",13
1110 DATA"A 1 COIN",11
1120 DATA"A BAUBLE",39
1130 DATA"A SILVER SPEAR. JUST RIGHT FOR       MONSTERS OF ALL TYP
ES",40
1135 DATA"A GOLDEN COLOURED RING",4
1140 DATA"A CAN OF OIL",15
1150 DATA"A DIRTY OLD PLANT POT",43
1160 DATA"A REAL PLASTIC CRUCIFIX",6
1170 DATA"BILL & BEN GUARDING THE ENTRANCE TO A TUNNEL",12
1180 DATA"AN EVIL BALROG",16
1190 DATA"A LARGE ALTAR",27
1200 DATA"AN EVIL MENACING VAMPIRE WHO WON'T LETME PASS",42
1210 DATA"A SEEMINGLY INNOCENT OLD MAN WHO WON'TLET ME PASS",10
1220 DATA"A COFFIN COVERED WITH MUD",25
1230 DATA"A RUSTY LOCK",45
1240 DATA"AN EVIL HOBGOBLIN WITH HALITOSIS",34
1250 DATA"A SILVER PLATED CASKET WITH NO LID",26
1260 DATA"A BROKEN LID",24
1270 DATA"A SMALL PACK HORSE",32
1280 DATA"A SLEEPING MONSTER",23
1300 DATA"A GREEDY LITTLE ORC WARRIOR GUARDING   THE BRIDGE",21
1310 DATA"A TINY BEANSTALK WITH A LABEL          ATTACHED",3
1320 DATA"A PACKET OF FERTILISER",44
1330 DATA"A BRASS MONKEY",2
1340 DATA"A CHAIN",20
1350 DATA"SOME MUSHROOMS (I THINK)",18
1360 DATA"TOAD",1,"PRINCE",1
1370 DATA"GIRL",2,"LITTLE",2
1380 DATA"WALLET",3,"FLASK",4,"BRANDY",4
1390 DATA"DWARF",5,"RUBY",6
1400 DATA"SHOTGUN",7,"GUN",7
1410 DATA"DIAMOND",8
1420 DATA"ANTIQUE",9,"DAGGER",9
1425 DATA"FRIEND",10,"ARTHUR",10
```

```
1430 DATA"MEDICINE",11,"VENDING",12,"CHOCOLATES",12
1450 DATA"COIN",13,"BAUBLE",14
1460 DATA"GOLDEN",15,"SPEAR",15,"RING",16
1465 DATA"OIL",17,"DIRTY POT",18,"POTS",18
1467 DATA"CRUCIFIX",19,"CROSS",19,GUARD",20
1470 DATA"BALROG",21,"ALTAR",22,"VAMPIRE",23,"MAN",24
1480 DATA"DEMON",25,"DOOR",25,"GOBLIN",27,"CASKET",28
1500 DATA"LID",29,"HORSE",30
1510 DATA"SLEEPING MONSTER",31,"MONSTER",31
1520 DATA"ORC",32,"WARRIOR",32
1530 DATA"BEAN",33,"LABEL",33
1540 DATA"PACKET",34,"FERTILISER",34,"MONKEY",35,"CHAIN",36,"MUSHRO
OMS",37
1550 GOSUB3030
1560 IFL$="PLANT"THENPRINT"SORRY":GOTO250
1570 IFL%=1THEN1590
1580 GOTO250
1590 E%=0
1600 FORH=1 TO37
1605 IFB%(H,1)=P% ANDB%(N%(R),1)=P%THENE%=1
1610 NEXTH
1620 IFE%=0THEN250
1630 CLS:IFP%=12ANDR=30THENPRINTX$(3):GOTO110
1640 IFP%=16ANDR=31THENPRINTX$(4):GOTO110
1641 IFP%=20ANDR=52THENPRINT"GET A LAVATORY CHAIN? YOU'RE JOKING":G
OTO110
1650 IFP%=27ANDR=32THENPRINTX$(5):GOTO110
1660 IFP%=10ANDR=34THENPRINTX$(7):GOTO110
1661 IFP%=37AND(R=30RR=4)ANDXX%<>1THENPRINTX$(52):GOTO110
1662 IFP%=37AND(R=30RR=4)ANDXX%=1THENPRINT"SHE SMILES AS SHE EATS A
 CHOCOLATE"
1670 IFP%=42ANDR=33THENPRINTX$(6):GOTO110
1680 IFP%=25AND(R=35ORR=36)THENPRINTX$(8):GOTO110
1690 IFP%=14AND(R=10RR=2)ANDB%(2,1)=-1THENGOTO1810
1700 IFP%=45AND(R=37ORR=38)THENPRINTX$(45):GOTO250
1710 IFP%=34ANDR=39THENPRINTX$(46):GOTO250
1720 IFP%=21AND(R=40RR=45)THENPRINTX$(47):GOTO250
1730 IFP%=14AND(R=10RR=2)ANDB%(2,1)<>14THENPRINTX$(17):GOTO110
1740 IFP%=13ANDR=19ANDB%(13,1)<>13THENPRINTX$(19):GOTO110
1741 IFP%=13ANDR=18ANDB%(13,1)<>13THENPRINTX$(10):GOTO110
1750 IFP%=9AND(R=6ORR=7)ANDB%(3,1)=9THEN1810
1760 IFP%=9AND(R=6ORR=7)ANDB%(13,1)=9THENPRINTX$(21):GOTO250
1770 IFP%=9AND(R=6ORR=7)ANDB%(13,1)<>9THENPRINTX$(36):GOTO250
1780 IFP%=29ANDB%(4,1)<>29THENPRINTX$(54):GOTO110
1790 IFP%=28AND(R=15ORR=16)ANDB%(11,1)<>28THENPRINTX$(56):GOTO110
1800 IFP%=28AND(R=15ORR=16)ANDB%(11,1)=28THENG$(10)=X$(57):B%(11,1)
=-1
1810 E%=0
1820 FORD=1TO3:IFV$(D)=""THENV$(D)=G$(N%(R)):PING:E%=1:D=4
1830 NEXT
1840 IFE%=0THENPRINTX$(38):GOTO250
1850 B%(N%(R),1)=0:GOTO110
1860 GOSUB3030
1870 IFL%=1THEN1890
1880 PRINT:PRINT:PRINT"I CAN'T SEE A ";L$:EXPLODE:PAPER7:INK4:GOTO2
50
1890 E%=0
1900 FORD=1TO3
1905 IFV$(D)=G$(N%(R))THENV$(D)="":E%=1
1910 NEXT
1911 PING
1920 IFE%=1THEN1940
1930 PRINTX$(39):PING:PAPER2:INK7:GOTO250
1940 B%(N%(R),1)=P%
1950 CLS
1960 IFP%=7ANDR=24THENPRINTX$(1):S%(7,2)=12:B%(16,1)=-1:O$(7)="BY A
N OPEN GATE"
1970 IFP%=12AND(R=26ORR=27)THENPRINTX$(2):S%(12,2)=17:S%(12,3)=13
1971 IFP%=12AND(R=26ORR=27)THENB%(20,1)=-1:B%(18,1)=0
1980 IFP%=14AND(R=3ORR=4)THENPRINTX$(9):G$(1)=X$(13):B%(2,1)=-1:GOT
O110
1981 IFP%=37AND(R=18ORR=19)THENXX%=1
2000 IFP%=29AND(R=6ORR=7)THENG$(5)=X$(14):PRINTX$(12):GOTO110
2010 IFP%=28ANDR=17THENPRINTX$(16):G$(10)="MY FRIEND ARTHUR":GOTO11
0
2020 IFP%=13ANDR=20THENPRINTX$(18):ZAP:G$(12)="A BOX OF CHOCOLATES"
:GOTO110
2030 IFP%=45ANDR=25THENPRINTX$(20):S%(45,1)=46:B%(26,1)=-1:B%(17,1)
=-1:GOTO110
2040 IFP%=22AND(R=49ORR=50)ANDB%(33,1)=22THENPRINTX$(53):S%(22,2)=3
0:S%(22,3)=23
2041 IFP%=22AND(R=49ORR=50)ANDB%(33,1)=22THENG$(33)=X$(61):X$(55)="
":GOTO110
2050 IFP%=22AND(R=47ORR=48)ANDB%(34,1)=22THENPRINTX$(53):S%(22,2)=3
0:S%(22,3)=23
2051 IFP%=22AND(R=47ORR=48)ANDB%(34,1)=22THENG$(33)=X$(61):X$(55)="
":GOTO110
2061 IFP%=27ANDB%(12,1)=27ANDB%(1,1)=0THENS%(27,3)=28:B%(12,1)=0:G$
(22)=X$(58)
2080 IFP%=21ANDR=53THENPRINTX$(47):S%(21,2)=29:B%(32,1)=0:B%(53,1)=
0:GOTO110
2090 IFP%=13AND(R=18ORR=19)ANDB%(13,1)=13THENPRINTX$(18):GOTO110
2100 IFP%=34ANDR=8THENPRINTX$(25):S%(34,3)=35:B%(5,1)=-1:B%(27,1)=-
1:GOTO110
2110 GOTO110
2120 IFP%=10ANDB%(7,1)=0THENPRINTX$(27):S%(10,3)=5:G$(24)=X$(28):SH
OOT:GOTO110
2130 IFP%=29ANDM%=0THENPRINTX$(29):SHOOT:GOTO110
2140 IFB%(7,1)<>0THENPRINT"I DON'T HAVE A GUN":GOTO250
2150 PRINTX$(30):GOTO250
2160 GOSUB3030
2170 IFP%=27ANDR=28THENPRINTX$(31):S%(27,3)=28:GOTO110
2180 IFP%=24THENPRINTX$(37):GOTO110
2190 PRINT"INTO WHAT?":GOTO250
2200 GOSUB3030
2210 IFB%(8,1)=0ANDR=12THENPRINTX$(34):GOTO110
2211 IFP%=12AND(R=26ORR=27)THENPRINTX$(40):GOTO110
2220 IFP%=25ANDR=35ORR=36THENPRINTX$(59)
2230 IFB%(15,1)=0ANDR=15THENPRINTX$(22):GOTO110
2240 IFP%=24THENPRINTX$(37):GOTO110
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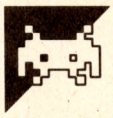
```
2241 IFP%=39ANDR=21THENPRINTX$(41):GOTO110
2243 IFP%=14AND(R=10RR=2)THENPRINTX$(42):GOTO110
2250 IF(R=47ORR=48)ANDB%(33,1)=0THENPRINTX$(23):GOTO110
2260 IF(R=22ORR=23)ANDB%(15,1)=0THENPRINTX$(22):GOTO110
2270 PRINTX$(35):GOTO250
2280 PAPER2:INK0:PRINT"I HAVE:-"
2285 PRINT" A CRUCIFIX AROUND MY NECK AND"
2290 F%=0
2300 FORH=1TO3
2305 IFV$(H)<>""THENPRINTV$(H):F%=1
2310 NEXT
2320 IFF%=0THENPRINT"NOTHING ELSE!!!!!!!"
2330 GOTO250
2340 IFP%=16ANDB%(21,1)=16THENPRINTX$(48)
2341 IFP%=16ANDB%(21,1)=16THENS%(16,2)=21:S%(16,3)=22:B%(21,1)=0:GO
TO110
2350 GOTO110
2360 GOSUB3030
2370 IFP%=42ANDR=28THENPRINTX$(31):S%(42,3)=40:G$(23)=X$(24):ZAP:GO
TO110
2380 PRINTX$(32):GOTO250
2390 CLS:PAPER6:INK0:PRINT:PRINT:PRINT:PRINT" I'M AS CONFUSED AS YO
U ARE"
2391 PING
2395 PRINT:PRINT:PRINT" I SUPPOSE YOU COULD TRY PRAYING":GOTO250
2410 X$(1)="THE PAWNBROKER RUBS HIS HANDS IN GLEE HE GRABS IT AND R
UNS IN"
2420 X$(2)="BEN GRABS IT AND RUNS AWAY SHOUTING  SOMETHING ABOUT A
 PRESENT"
2430 X$(3)="YOU MUST BE JOKING"
2440 X$(4)="WHAT DO YOU THINK^I AM? HAVE YOU SEEN THOSE FANGS DRIPP
ING BLOOD"
2450 X$(5)="I KNOW I'M SUPERMAN, BUT EVEN I CAN'T MOVE THAT"
2460 X$(6)="WHAT DO YOU THINK I AM ? A SUCKER?"
2470 X$(7)="ALL THAT GLITTERS !!!!!!!!"
2480 X$(8)="I'M NOT CARRYING THAT. THERE'S A DEAD BODY IN THERE"
2490 X$(9)="THE GIRL CHASES THE TOAD AND KISSES ITIT CHANGES INTO A
 PRINCE"
2500 X$(10)="I'M NOT A THIEF YOU KNOW. I NEED A  COIN !!!!"
2510 X$(11)="O.K"
2520 X$(12)="THE OLD DWARF DRINKS THE BRANDY AND  SMILES"
2530 X$(13)="AN UGLY PRINCE"
2540 X$(14)="AN OLD DWARF. HE IS HAPPY TO COME  ALONG NOW"
2550 X$(15)="ARNOLD STILL ISN'T FEELING WELL ENOUGH"
2560 X$(16)="HEALTHY ARTHUR"
2570 X$(17)="THE TOAD HOPS AWAY"
2580 X$(18)="THE COIN FITS. I GET A BOX OF  CHOCOLATES. "
2590 X$(19)="I CAN'T CARRY THE WHOLE MACHINE YOU  KNOW"
2600 X$(20)="AFTER A SECOND, THE LOCK OPENS"
2610 X$(21)="THE LANDLORD GRINS AND SAYS 'I DONT  ACCEPT THOSE"
2620 X$(22)="THERE'S AN INSCRIPTION ON IT, BUT I  CAN'T QUITE MAKE
 IT OUT"
2630 X$(23)="THE LABEL READS ' FOR RAPID GROWTH  USE GROWMORE FER
TILISER"
2640 X$(24)="THE DARK OPENING TO A CRYPT"
2650 X$(25)="THE DWARF CHASES THE HOBGOBLIN AWAY WITH HIS AXE"
2660 X$(26)="SEEMS LIKE A GOOD IDEA. BUT NOTHING  HAPPENS"
2670 X$(27)="THE BODY SHRIVELS AWAY AND A PILE OF  DUST FALLS TO TH
E GROUND"
2680 X$(28)="AN EVIL SMELLING MONSTER WITH BLUE  VENOM DRIPPING F
ROM IT"
2690 X$(29)="WHOOPS !! MISSED"
2700 X$(30)="BANG:NOTHING HAPPENED"
2710 X$(31)="THE VAMPIRE RUNS FOR ITS LIFE AND LETS ME PASS"
2720 X$(32)="IT DOESN'T SEEM TO DO ANYTHING AT THE MOMENT"
2730 X$(33)="THE VAMPIRE'S ALREADY GONE"
2740 X$(34)="THE DIAMONDS MUST BE VALUABLE"
2750 X$(35)="I CAN'T SEE ANYTHING UNUSUAL"
2760 X$(36)="THE LANDLORD DOESN'T LIKE THAT"
2770 X$(37)="IT BEARS THE INSCRIPTION: A PERFECT  GIFT FOR ALL"
2780 X$(38)="I MAY BE SUPERMAN, BUT I JUST CAN'T  CARRY ANY MORE"
2790 X$(39)="I'VE NOT GOT IT DUMMY"
2800 X$(40)="THE POTS ARE RATHER TATTY"
2810 X$(41)="A WORTHLESS BAUBLE"
2820 X$(42)="IT'S TO FAST FOR ME."
2830 X$(43)="WATCH OUT I THINK I MAY HAVE BEEN  SPOTTED"
2840 X$(44)="I'VE JUST BEEN ATTACKED"
2850 X$(45)="I CAN'T MOVE IT. IT'S TOO RUSTY"
2860 X$(46)="YOU MUST BE JOKING. WITH BREATH LIKE  THAT !!!!!!!!!!!
!!"
2870 X$(47)="IT EATS THE MUSHROOM^ AND GOES INTO  A STUPOR"
2880 X$(48)="STRAIGHT THROUGH THE HEART. I GRAB  THE STAKE BACK Q
UICKLY"
2890 X$(49)="ORCS ARE FAR TOO VISCIOUS AND NASTY"
2900 X$(50)="SEEMS LIKE A GOOD IDEA"
2910 X$(51)="THE HORSE HAS JUST FAINTED"
2920 X$(52)="THE GIRL REFUSES TO COME!!"
2930 X$(53)="THE BEAN SPURTS INTO FURIOUS GROWTH.  I CAN USE IT TO
CLIMB OVER"
2940 X$(54)="THE DWARF REFUSES TO COME"
2950 X$(55)="THERE IS A WALL HERE, BUT I CAN'T  CLIMB IT. THE SO
IL IS GOOD"
2960 X$(56)="ARTHUR IS TOO ILL TO TRAVEL"
2970 X$(57)="MY HEALTHY FRIEND ARTHUR"
2980 X$(58)="THE ALTAR HAS MOVED ASIDE THERE  ARE TWO PASSAGES BEH
IND IT"
2990 X$(59)="THERE'S A HALF DECOMPOSED BODY IN THERE"
3000 X$(60)="I'M SORRY I DON'T KNOW THAT WORD"
3010 X$(61)="THE BEAN GROWS SO MUCH THAT I CAN  CLIMB THE WALL"
3020 RETURN
3030 L$="":FORH=1TOLEN(Z$)
3040 IF MID$(Z$,H,1)=" " THENL$=RIGHT$(Z$,(LEN(Z$)-H)):H=H+40
3050 NEXT
3060 R=0
3070 L%=0:IFLEN(L$)<2THENRETURN
3080 FORH=1TO53:IFLEFT$(N$(H),LEN(L$))=L$ THENL%=1:R=H
3090 NEXT
3100 RETURN
3110 PAPER3:INK4:CLS:PRINT:PRINT:PRINT"THE FOREST OF DOOM"

3112 PRINT:PRINT:PRINT:PRINT:PRINT
```

PROGRAMS

```
3115 PRINT:PRINT:PRINT"      AN ADVENTURE"
3116 PRINT:PRINT:PRINT:PRINT
3117 PRINT:PRINT:PRINT:PRINT:PRINT"              BY S.W. LUCAS"
3118 PRINT:PRINT:PRINT:PRINT:PRINT"PLEASE WAIT A MOMENT"
3140 RETURN
3150 A%=0
3155 IFB%(6,1)=2THENA%=A%+1
3157 IFB%(1,1)=2THENA%=A%+1
3160 IFB%(8,1)=2THENA%=A%+1
3170 IFB%(9,1)=2THENA%=A%+1
3180 IFB%(10,1)=2THENA%=A%+1
3190 IFB%(15,1)=2THENA%=A%+1
3200 RETURN
3210 CLS
3220 PRINT:PRINT:PRINT:PRINT"     YOU DIRTY FILTHY BEAST"
3230 PRINT"     GO AND WASH YOUR MOUTH OUT"
3235 PRINT:PRINT:PRINT"YOU HAD BETTER SAY SOMETHING NICE TO  ME!!!"
3240 INPUTA$:IFLEFT$(A$,3)<>"SOR"THENPRINT"THAT'S NOT GOOD ENOUGH":
GOTO3240
3250 PRINT"THAT'S BETTER":GOTO110
3260 IFP%=27THEN4000
3261 PRINT:PRINT:PRINT:PRINT:PING:PAPER1:INK0:PRINT"THAT DOESN'T SE
EM TO HELP"
3265 PRINT:PRINT"MAYBE I DIDN'T TRY HARD ENOUGH"
3270 GOTO250
3280 GOSUB3030
3290 IFLEFT$(L$,3)="MON"THENPRINT"THE MONKEY IS NOT PLEASED":GOTO25
0
3300 PRINT"DON'T BE SILLY":GOTO250
4000 PAPER5:INK0
4005 S%(27,2)=39:S%(27,3)=28:G$(22)=X$(58)
4010 ZAP
4020 WAIT10
4030 PRINT:PRINT:PRINT:PRINT:PRINT"THIS IS ABSOLUTELY AMAZING!!!!"
4040 PING
4050 WAIT10
4060 PRINT:PRINT:PRINT"THE ALTAR HAS SLID TO ONE SIDE          THERE
ARE TWO PASSAGES BEHIND"
4070 GOTO250
4500 IFP%=20ANDR=52THEN EXPLODE:EXPLODE:PRINT"WELL YOU DID ASK ME T
O FLUSH IT"
4510 IFP%<>20THENPRINT"PULL WHAT????"
4530 GOTO110


1480 DATA"COFFIN",25,"CORPSE",25
1490 DATA"DOOR",26,"LOCK",26,"GOBLIN",27,"CASKET",28
```



Program of the Month
DRAGON ARTIST by M Sexton

Dragon 'Artist' is a sketch program for the Dragon 32/64.

Designs may be drawn on the screen using the cursor keys, and the completed sketch can be saved to cassette for later loading. Radius, line and paint facilities are offered to enable quite complex patterns to be made.

The only facility the program lacks in its present form is a screen dump routine. I would think the easiest way to link 'Artist' to a screen dump routine would be when a design is loaded back in from cassette.

Full instructions are contained within the program.

```
10 REM*****************************
20 REM*****DRAGON ARTIST*****
30 REM*****(C) M.SEXTON 1983*****
40 REM*****************************
50 CLS
60 DIM A(1229)
70 PRINT@10,"dragon artist":PRINT@42,"------ ------"
80 PRINT"THIS IS A DRAWING APPLICATION   FOR THE DRAGON 32 COMPUTER."
90 PRINT"PICTURES MAY BE DRAWN IN THE    FOLLOWING MODES:"
100 PRINT"PMODE0.","PMODE1.","PMODE2.","PMODE3.","PMODE4."
110 PRINT"IN THE PMODES EITHER OF THE TWO AVAILABLE COLOUR SETS MAY BE    USED."
120 PRINT:PRINT"        press any key"
130 A$=INKEY$:IF A$="" THEN 130
140 CLS
150 PRINT"WHEN YOU ARE IN THE CHOSEN MODE WITH YOUR CHOSEN COLOUR SET YOU WILL S
EE THAT THE MIDDLE POINT  ON THE SCREEN IS SET."
160 PRINT"THIS POINT CAN BE MOVED AROUND  THE SCREEN USING THE ARROW KEYS AND AS
 IT MOVES IT WIL LEAVE A  TRAIL IN THE CURRENT FOREGROUND COLOUR."
170 PRINT"IF YOU DO NOT REQUIRE IT TO     LEAVE A TRAIL AS IT MOVES PRESS 'b' BE
FORE YOU START TO MOVE    IT.TO LEAVE A TRAIL AGAIN PRESS 'w'."
180 PRINT"        press any key"
190 A$=INKEY$:IF A$="" THEN 190
200 CLS
210 PRINT:PRINT"TO CHANGE THE FOREGROUND COLOUR PRESS THE SPACE BAR AND THE
COLOUR WILL CHANGE TO THE NEXT  AVAILABLE IN THE PRESENT MODE   AND SCREEN."
220 PRINT:PRINT"WHEN YOU HAVE MOVED THE POINT   TO YOUR CHOSEN SPOT ON THE
SCREEN YOU CAN DRAW EITHER A    LINE A CIRCLE OR A RECTANGLE."
230 PRINT:PRINT"        press any key"
240 A$=INKEY$:IF A$="" THEN 240:CLS
250 PRINT:PRINT:PRINT"TO DRAW A LINE BETWEEN TWO      POINTS ON THE SCREEN POSIT
ION   THE ILLUMINATED SPOT AT THE     PLACE WHERE YOU WANT THE LINE   TO START A
ND PRESS '1'."

270 PRINT:PRINT:PRINT"        press any key"
280 A$=INKEY$:IF A$="" THEN 280
290 CLS
300 PRINT"THEN MOVE THE ILLUMINATED SPOT  TO THE PLACE WHERE YOU WANT THE LINE T
O END AND PRESS '1' AGAIN AND A LINE WILL BE DRAWN FROM   THE FIRST POINT TO THE
 SECOND."
310 PRINT"TO RUB OUT THE LINE YOU HAVE    JUST DRAWN GO TO THE BEGINNING  AND PR
ESS 'm' THEN TO THE END   AND PRESS 'm'.IF THE LINE DOES  NOT ALL GO YOU MUST TR
Y AGAIN   TRYING TO GET THE POINT EXACTLY ON THE BEGGINING AND END OF THE LINE."
320 PRINT"        press any key"
330 A$=INKEY$:IF A$="" THEN 330
340 CLS
350 PRINT"TO DRAW A CIRCLE POSITION THE   ILLUMINATED SPOT AT THE PLACE   WHERE
YOU WANT THE CENTRE OF    THE CIRCLE TO BE AND PRESS 'c'."
360 PRINT"YOU WILL NOW RETURN TO A TEXT   SCREEN AND YOU WILL BE ASKED    THE RA
```


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PROGRAMS

```
DIUS OF THE CIRCLE AND    WHETHER YOU WANT IT PAINTED IN  OR NOT."
370 PRINT"IF YOU CHOOSE TO PAINT THE      CIRCLE YOU WILL BE ASKED WHICH  COLOUR
 YOU WANT TO USE."
380 PRINT:PRINT"        press any key"
390 A$=INKEY$:IF A$="" THEN 390
400 CLS
410 PRINT"TO DRAW A RECTANGLE POSITION    THE ILLUMINATED SPOT AS FOR A   LINE B
UT INSTEAD OF PRESSING    'l' THE SECOND TIME PRESS 'r'."
420 PRINT"YOU WILL THEN BE RETURNED TO A  TEXT SCREEN AND ASKED IF YOU    WANT T
HE RECTANGLE TO BE        PAINTED."
430 PRINT"IF YOU CHOOSE TO PAINT THE      RECTANGLE YOU WILL BE ASKED     WHICH
COLOUR YOU WANT TO USE."
440 PRINT:PRINT"        press any key"
450 A$=INKEY$:IF A$="" THEN 450
460 CLS
470 PRINT:PRINT"IF AT ANY TIME YOU WISH TO      CLEAR THE SCREEN PRESS 's'.YOU
WILL THEN BE RETURNED TO A TEXT SCREEN AND ASKED WHAT MODE AND  SCREEN YOU WANT
TO USE."
480 PRINT:PRINT"TO SEE A SUMMARY OF THESE       COMMANDS AT ANY TIME WHILE ON
THE DRAWING SCREEN PRESS 'h'."
490 PRINT:PRINT"        press any key"
500 A$=INKEY$:IF A$="" THEN 500
510 CLS
520 PRINT:PRINT:PRINT"IT IS PERFECTLY POSSIBLE TO     CREATE A DESIGN BY JUST MO
VING  THE ILLUMINATED SPOT BUT THE    CHOICES OF SPECIFIC SHAPES HAVE BEEN INCLU
DED TO MAKE IT EASIER TO CREATE MORE COMPLICATED      DESIGNS."
530 PRINT:PRINT"    press any key to start"
540 A$=INKEY$:IF A$="" THEN 540
550 CLS
560 PRINT@14,"mode":PRINT@46,"----"
570 PRINT"WHICH OF THE FOLLOWING MODES    WOULD YOU LIKE TO USE:"
580 PRINT"<1> PMODE0."
590 PRINT"<2> PMODE1."
600 PRINT"<3> PMODE2."
610 PRINT"<4> PMODE3."
620 PRINT"<5> PMODE4."
630 PRINT@288,"";:INPUT"TYPE IN THE NUMBER ONLY <1-5>";M
640 IF M<1 OR M>5 THEN 630
650 PRINT:PRINT"        press any key"
660 A$=INKEY$:IF A$="" THEN 660
670 CLS
680 PRINT@128,"WHEN YOU HAVE FINISHED DRAWING  YOU MAY LIKE TO SAVE YOUR ART   O
N TAPE.PRESS y AND  FOLLOW  INSTRUCTIONS."
690 PRINT"YOU MAY ALSO LOAD DESIGNS FROM  TAPE.CHOOSE THE SCREEN AND MODE THEY W
ERE SAVED IN AND THEN     PRESS z AND FOLLOW INSTRUCTIONS"
700 PRINT:PRINT"        press any key"
710 IF INKEY$="" THEN 710
720 CLS
730 PRINT@13,"screen":PRINT@45,"------"
740 PRINT"WHICH OF THE 2 SCREENS WOULD":PRINT"YOU LIKE TO USE:"
750 PRINT"<0> SCREEN1,0."
760 PRINT"<1> SCREEN1,1."
770 PRINT@192,"";:INPUT"PLEASE TYPE THE NUMBER (0 OR 1)";S
780 H=S
790 IF S<0 OR S>1 THEN 770
800 PRINT:PRINT:PRINT"        press any key"
810 A$=INKEY$:IF A$="" THEN 810
820 CLS
830 P=M-1
840 PRINT@160,"YOU HAVE CHOSEN MODE:";P;"AND":PRINT"SCREEN:";S
850 IF S=1 AND P<>1 AND P<>3 THEN PRINT"THE COLOURS AVAILABLE ARE BLACK AND BUFF
."
860 IF S=1 AND P=0 OR P=2 OR P=4  THEN 880
870 IF S=0 AND P=0 OR P=2 OR P=4  THEN PRINT"THE COLOURS AVAILABLE ARE BLACK AND
 GREEN."
880 IF S=0 AND P<>0 AND P<>2 AND P<>4 THEN PRINT"THE COLOURS AVAILABLE ARE GREEN
 YELLOW BLUE AND RED."
890 IF S=1 AND P<>0 AND P<>2 AND P<>4 THEN PRINT"THE COLOURS AVAILABLE ARE BUFF
 CYAN MAGENTA AND ORANGE."
900 PRINT:PRINT"        press any key"
910 A$=INKEY$:IF A$="" THEN 910
920 PMODE P:SCREEN 1,S:PCLS
930 IF P=0 OR P=2 OR P=4 THEN A=1
940 IF P=1 OR P=3 AND S=0 THEN A=2
950 IF P=1 OR P=3 AND S=1 THEN A=6
960 X=128:Y=96
970 O=0
980 PSET(X,Y,A)
990 A$=INKEY$:IF A$="" THEN 990
1000 IF A$="H" THEN 1500
1010 IF A$="W" THEN B=0
1020 IF A$="B" THEN B=1
1030 IF A$=CHR$(9) AND B=1 THEN PRESET(X,Y): X=X+1:IF X>252 THEN X=252
1040 IF A$=CHR$(9) THEN X=X+1:IF X>252 THEN X=252
1050 IF A$=CHR$(8) AND B=1 THEN PRESET(X,Y):X=X-1:IF X<2 THEN X=2
1060 IF A$=CHR$(8) THEN X=X-1:IF X<2 THEN X=2
1070 IF A$=CHR$(10) AND B=1 THEN PRESET(X,Y):Y=Y+1:IF Y>188 THEN Y=188
1080 IF A$=CHR$(10) THEN Y=Y+1:IF Y>188 THEN Y=188
1090 IF A$=CHR$(94) AND B=1 THEN PRESET(X,Y):Y=Y-1:IF Y<2 THEN Y=2
1100 IF A$=CHR$(94) THEN Y=Y-1:IF Y<2 THEN Y=2
1110 IF A$="S" THEN 550
1120 IF A$=" " AND P<>0 AND P<>2 AND P<>4 THEN GOTO 1130
1130 IF A$=" " AND H=0 THEN A=A+1:IF A>4 THEN A=2
1140 IF A$=" " AND H=1 THEN A=A+1:IF A>8 THEN A=6
1150 IF O=1 AND A$="R" THEN 1660
1160 IF A$="M" AND O=0 THEN 1450
1170 IF A$="C" THEN CLS:GOTO 1320
1180 IF A$="L" AND O<>1 THEN 1450
1190 IF A$="L" AND O=1 THEN COLOR A:LINE(X,Y)-(J,K),PSET:O=0
1200 IF A$="M" AND O=1 THEN LINE(X,Y)-(J,K),PRESET
1210 IF A$="Y" AND P=0 THEN 1830
1220 IF A$="Y" AND P=1 THEN 1920
1230 IF A$="Y" AND P=2 THEN 2010
1240 IF A$="Y" AND P=3 THEN 2100
1250 IF A$="Y" AND P=4 THEN 2190
1260 IF A$="Z" AND P=0 THEN 2290
1270 IF A$="Z" AND P=1 THEN 2370
1280 IF A$="Z" AND P=2 THEN 2450
1290 IF A$="Z" AND P=3 THEN 2530
1300 IF A$="Z" AND P=4 THEN 2610
1310 GOTO 980
1320 PRINT@13,"CIRCLE":PRINT@45,"------"
1330 INPUT"RADIUS";RR
1340 INPUT"PAINT (Y/N)";PP$
1350 IF PP$="N" OR PP$<>"Y" THEN SCREEN 1,S:CIRCLE(X,Y),RR,A
1360 IF PP$="N" THEN 980
1370 IF PP$<>"Y" THEN 980
1380 IF PP$="Y" THEN IF P<>0 AND P<>2 AND P<>4 AND S=0 THEN INPUT"COLOUR <2> YEL
LOW <3> BLUE <4>  RED";CC
1390 IF PP$="Y" AND P<>0 AND P<>2 AND P<>4 AND S=1 THEN INPUT"COLOUR <6> CYAN <7
>MAGENTA <8>  ORANGE.";CC
1400 IF PP$="Y" AND  P<>0 AND P<>2 AND P<>4 THENINPUT"BOUNDARY COLOUR (SAME NUMB
ERS)";DD
1410 SCREEN 1,S
1420 CIRCLE(X,Y),RR,A
1430 PAINT(X+(RR/2),Y),CC,DD
1440 GOTO 980
1450 O=1
1460 IF A$="M" THEN J=X:K=Y
1470 J=X:K=Y
1480 GOTO 980
1500 CLS:PRINT"      SUMMARY OF COMMANDS"
1510 PRINT"      ------------------"
1520 PRINT"arrow keys:MOVE AROUND SCREEN."
1530 PRINT"b:LEAVE NO TRAIL WHEN MOVING."
```

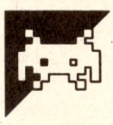
PROGRAMS

```
1540 PRINT"w:LEAVE TRAIL WHEN MOVING."
1550 PRINT"l:DRAW A LINE BETWEEN 2 POINTS."
1560 PRINT"m:DELETE LAST LINE DRAWN WITH 1"
1570 PRINT"c:DRAW A CIRCLE (CENTRE AT DOT)"
1580 PRINT"r:DRAW A RECTANGLE-USE AFTER 1."
1590 PRINT"s:CLEAR DRAWING SCREE."
1600 PRINT"h:DISPLAY HELP SCREEN."

1610 PRINT"y:TO SAVE PICTURE ON TAPE."
1620 PRINT"z:TO LOAD PICTURE FROM TAPE."
1630 PRINT:PRINT"          press any key"
1640 A$=INKEY$:IF A$="" THEN 1640
1650 SCREEN 1,S:GOTO 980
1660 CLS
1670 PRINT"            RECTANGLE"
1680 PRINT"            ---------"
1690 LINE(X,Y)-(J,K),PSET,B
1700 IF P<>0 AND P<>2 AND P<>4 THEN 1710 ELSE SCREEN 1,S:GOTO 980
1710 INPUT"PAINT (Y/N)";PP$
1720 IF PP$="N" THEN SCREEN 1,S:GOTO 980
1730 SCREEN 1,S:FOR I=1 TO 3000:NEXT
1740 IF S=0 THEN INPUT"COLOUR <2>YELLOW <3>BLUE <4>RED";CC
1750 IF S=1 THEN INPUT"COLOUR <6>CYAN <7>MAGENTA <8>   ORANGE";CC
1760 INPUT"BOUNDARY COLOUR (SAME NUMBERS";DD
1770 INPUT"IS THE POINT WHERE YOU PRESSED  r TO THE RIGHT OF THE POINT     WHERE
 YOU PRESSED l (Y OR N)";G$
1780 IF G$="Y" THEN PAINT(X-3,Y+5),CC,DD
1790 IF G$="N" THEN PAINT(X+3,Y+3),CC,DD
1800 O=0
1810 SCREEN1,S
1820 GOTO 980
1830 CLS:PRINT"SAVE TO TAPE"
1840 GET(0,0)-(255,191),A,G
1850 PRINT"PRESS ANY KEY TO SAVE."
1860 IF INKEY$="" THEN 1860
1870 FOR I=1 TO 1000:NEXT
1880 CSAVEM"ART",1536,3071,1536
1890 PRINT:PRINT"SAVED"
1900 FOR H=1 TO 1000:NEXT:PMODE 0:SCREEN 1,S
1910 GOTO 990
1920 CLS:PRINT"SAVE TO TAPE"
1930 GET(0,0)-(255,191),A,G
1940 PRINT"PRESS ANY KEY TO SAVE."
1950 IF INKEY$="" THEN 1950
1960 FOR H=1 TO 1000:NEXT
1970 CSAVEM"ART",1536,4607,3072
1980 PRINT:PRINT"SAVED"
1990 FOR H=1 TO 1000:NEXT:PMODE1:SCREEN1,S
2000 GOTO 990

2010 CLS:PRINT"SAVE TO TAPE"
2020 GET(0,0)-(255,191),A,G
2030 PRINT"PRESS ANY KEY TO SAVE."
2040 IF INKEY$="" THEN 2040
2050 FOR H=1 TO 1000:NEXT
2060 CSAVEM"ART",1536,4607,3072
2070 PRINT:PRINT"SAVED"
2080 FOR H=1 TO 1000:NEXT:PMODE2:SCREEN1,S
2090 GOTO 990
2100 CLS:PRINT"SAVE TO TAPE"
2110 GET(0,0)-(255,191),A,G
2120 PRINT"PRESS ANY KEY TO SAVE"
2130 IF INKEY$="" THEN 2130
2140 FOR H=1 TO 1000:NEXT
2150 CSAVEM"ART",1536,7679,6144
2160 PRINT:PRINT"SAVED"
2170 FOR H=1 TO 1000:NEXT:PMODE3:SCREEN1,S
2180 GOTO 990
2190 CLS:PRINT"SAVE TO TAPE"
2200 GET(0,0)-(255,191),A,G
2210 PRINT"PRESS ANY KEY TO SAVE"
2220 IF INKEY$="" THEN 2220
2230 FOR H=1 TO 1000:NEXT
2240 CSAVEM"ART",1536,7679,6144
2250 PRINT:PRINT"SAVED"
2260 FOR H=1 TO 1000:NEXT:PMODE4:SCREEN1,S
2270 GOTO 990
2280 PCLS
2290 CLS:PRINT"LOAD PICTURE FROM TAPE"
2300 PRINT:PRINT"POSITION TAPE AND PRESS ENTER"
2310 IF INKEY$="" THEN 2310
2320 CLOADM"ART",0
2330 PMODE0:SCREEN1,S
2340 GET(0,0)-(255,191),A,G
2350 PUT(0,0)-(255,191),A,PSET
2360 GOTO 990
2370 CLS:PRINT"LOAD PICTURE FROM TAPE"
2380 PRINT:PRINT"POSITION TAPE AND PRESS ENTER."
2390 IF INKEY$="" THEN 2390


2400 CLOADM"ART",0
2410 PMODE1:SCREEN1,S
2420 GET(0,0)-(255,191),A,G
2430 PUT(0,0)-(255,191),A,PSET
2440 GOTO 990
2450 CLS:PRINT"LOAD PICTURE FROM TAPE."
2460 PRINT:PRINT"POSITION TAPE AND PRESS ENTER."
2470 IF INKEY$="" THEN 2470
2480 CLOADM"ART",0
2490 PMODE2:SCREEN1,S
2500 GET(0,0)-(255,191),A,G
2510 PUT(0,0)-(255,191),A,PSET
2520 GOTO 990
2530 CLS:PRINT"LOAD PICTURE FROM TAPE."
2540 PRINT:PRINT"POSITION TAPE AND PRESS ENTER."
2550 IF INKEY$="" THEN 2550
2560 CLOADM"ART",0
2570 PMODE3:SCREEN1,S
2580 GET(0,0)-(255,191),A,G
2590 PUT(0,0)-(255,191),A,PSET
2600 GOTO 990
2610 CLS:PRINT"LOAD PICTURE FROM TAPE."
2620 PRINT:PRINT"POSITION TAPE AND PRESS ENTER."
2630 IF INKEY$="" THEN 2630
2640 CLOADM"ART",0
2650 PMODE4:SCREEN1,S
2660 GET(0,0)-(255,191),A,G
2670 PUT(0,0)-(255,191),A,PSET
2680 GOTO 990
```



MZ-80A TARGET WORD

By J W Hinton

'Target Word' took me rather by surprise. At first glance, it looked like a disguised 'Mastermind'—using letters rather than numbers. It isn't. It is a highly addictive and infuriatng game. The program has a vocabulary of

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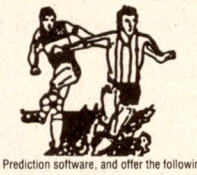
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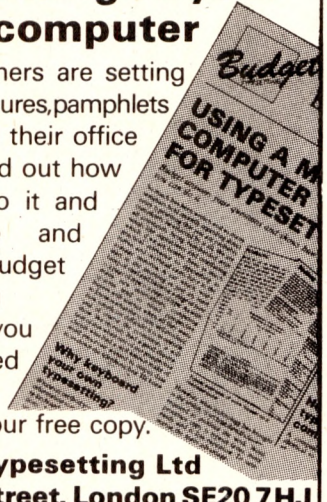
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PROGRAMS

300+ 3-letter words. One of these is randomly selected, and your task is to discover the word. The way in which the game progresses is similar to Mastermind, but with a twist: and it's this twist which makes the game fun.

After each guess, you are awarded one point for each correct letter; correct meaning the right letter in the right place, no points are awarded for the right letter in the wrong place as with Mastermind. Thus one letter correct nets one point, two correct nets two points and three letters correct nets three points. Easy? Ah, well this is where that twist makes its entry.

You see, the computer doesn't actually tell you how many points your guess was awarded! It does tell you whether the number of points awarded was odd or even by placing a marker in the appropriate column. Thus, a marker in the odd column means one correct letter, but a marker in the even column means either two or zero correct letters: you've got to decide which.

A very enjoyable game which should adapt easily to most machines since the author has included an ample sprinkling of remarks. The CURSOR statement is the equivalent of PRINT AT, though the values will, of course, have to be changed to suit different machines.

```
1 REM**TARGET WORD
2 REM**BY J.W.HINTON
3 REM**<C> AUGUST 1983
4 REM**FOR SHARP MZ-80A
5 GOSUB3000:TEMPO7
9 REM**DATA FOR WORDS
10 DATAASH,ALE,ARE,ASK,ASP,AXE
15 DATAAND,ADD,ASK,AIM,ATE,BAD,BAT,BEG,BEE,BET,BIB,BID,BIG,BIN,BIT,BOD,BOO,BOX
20 DATABOP,BOY,BUG,BUN,BUY,BYE,CAD,CAB,CAN,CAP,CAR,CAT,COB,COD,COT,COY,COP,COG
30 DATACON,CUT,CUP,CUD,CUB,DAY,DAD,DAB,DAM,DEW,DEN,DIP,DIG,DIN,DIM,DOT
40 DATADON,DUG,DUB,DYE,DIE,EAT,EAR,EBB,EEL,EGG,ELK,ELM,ERR,EVE,FAD,FAT,FAR
50 DATAFAN,FEW,FED,FEN,FIT,FIR,FIG,FIB,FIN,FLY,FOR,FOG,FOX,FIX,FRY,FUN
60 DATAGAB,GAP,GET,GIG,GIN,GNU,GOT,GOD,GUN,HAT,HAS,HAD,HAM,HEN,HEM,HIT,HIP,HIS
70 DATAHIM,HOT,HOP,HOG,HUT,HOW,HUM,ICE,ILL,INN,JAB,JAW,JAR,JAG,JAM,JET,JIG,JOT
80 DATAJOG,JUT,JUG,KEY,KEG,KIT,KID,KIN,KIP,LAC,LAD,LAP,LAG,LEA,LED,LEG,LIP,LID
90 DATALOT,LOG,LOB,LIE,LOO,MAR,MAT,MAY,MAP,MAD,MAN,MEW,MET,MEN,MID,MOP,MOB,MUD
100 DATAMUG,NAP,NAG,NEW,NET,NIT,NIP,NIB,NOW,NOT,NOD,NUT,OAR,OAT,OFF,OIL,OLD
110 DATAONE,OPT,ORB,ORE,OUR,OUT,OVA,OWE,OWL,OWN,PAD,PAN,PAR,PET,PEN,PIT,PIG
120 DATAPIN,PLY,POT,PEA,PRY,PUT,PUN,POX,RAT,RAP,RAG,RAM,RID,RIG,RIP,RIB,RIM
130 DATAROT,ROD,ROB,ROW,RUT,RUB,RUN,RUM,SAW,SAT,SAD,SAG,SEA,SEE,SET,SHE,SIT
140 DATASIP,SIN,SKI,SLY,SOW,SOD,SOB,SON,SPY,STY,SUP,SUD,SUN,SUM,SEW,SEX
150 DATATAR,TAP,TAG,TAB,TAN,TEE,TEA,TEN,THE,THY,TIP,TIN,TOW,TOR,TOY,TOP,TON
160 DATATRY,TOE,TOO,TUG,TUB,TWO,TIE,URN,USE,VAN,VAT,VET,VEX,VIE,WAD,WAG,WAR
170 DATAWAS,WAX,WEE,WEB,WET,WHO,WHY,WIG,WIN,WIT,WOE,WOO,WRY,YAK,YAM,YEN,YEW
180 DATAYES,YET,YON,YOU,ZIP,ZOO
399 REM**INITIALISE
400 DIMA$(160),B$(160)
500 FORI=1TO152:READA$(I),B$(I):NEXT
599 REM**CHOOSE A WORD
600 X=INT(RND(1)*152)+1
610 N=0:I=0:D$=""
650 IFRND(1)>.5THENWORD$=A$(X):GOTO670
660 WORD$=B$(X)
669 REM**SPLIT WORD INTO THE 3 LETTERS
670 P1$=LEFT$(WORD$,1):P2$=MID$(WORD$,2,1):P3$=RIGHT$(WORD$,1)
700 PRINT"@Okay, I have thought of a three-letter"
710 PRINT"word...try to work out what it is."
720 CURSOR4,5:PRINT"ODD:(1)":CURSOR25,5:PRINT"EVEN:(0,2)"
730 PRINT"                    ";
740 FORI=7TO23:CURSOR19,I:PRINT"|":NEXT
750 EX=21:CE=7:OX=0:CO=7:GO=1
799 REM**GET WORD
800 CURSOR0,3:PRINT"Enter your word...   ";
801 I=0:Q$=""
810 GETG$:IFG$=""THEN810
811 I=I+1
819 REM**IF SPACE THEN CLEAR WORD
820 IFG$=" "THEN800
825 PRINTG$;:Q$=Q$+G$
829 REM**HAVE 3 LETTERS BEEN USED?
830 IFI=3THEN900
839 REM**JINGLE AFTER EACH LETTER
840 MUSIC"D2C3-C4"
850 GOTO810
899 REM**IS WORD CORRECT?
900 IFQ$=WORD$THEN2000
905 N=0
909 REM**SPLIT WORD INTO THE 3 LETTERS
910 T1$=LEFT$(Q$,1):T2$=MID$(Q$,2,1):T3$=RIGHT$(Q$,1)
929 REM**TEST FOR CORRECT LETTERS
930 IFT1$=P1$THENN=N+1
940 IFT2$=P2$THENN=N+1
950 IFT3$=P3$THENN=N+1
959 REM**PUT WORD IN EVEN COLUMN
960 IF(N=0)+(N=2)THENCURSOREX,CE:PRINTQ$:CE=CE+1:IFCE>23THENEX=EX+4:CE=7
969 REM**PUT WORD IN ODD COLUMN
970 IFN=1THENCURSOROX,CO:PRINTQ$:CO=CO+1:IFCO>23THENOX=OX+4:CO=7
974 REM**JINGLE AFTER EACH WORD
975 MUSIC"E3D3-A2C4"
979 REM**INCREMENT NUMBER OF TURNS
980 GO=GO+1:IFGO=84THEN5000
990 GOTO800
999 REM**WORD WAS CORRECT
2000 PRINT"&YES!!!
2010 PRINT"The word was ";Q$
2020 PRINT"Well done!"
2025 PRINT"You got it in";GO;" goes
2026 GOSUB4000
2030 PRINT"Another game?"
2040 GETA$:IFA$=""THEN2040
2050 IFA$="Y"THEN600
2060 PRINT"&";:END
2999 REM**INSTRUCTIONS
3000 PRINT"&        T A R G E T   W O R D
3005 PRINT"
3007 USR(62)
3010 PRINT"This is a game of intuition in which"
3020 PRINT"the computer thinks of a common three-
3030 PRINT"letter word."
3040 PRINT"You try to work out what the word is."
3050 PRINT"To do this you enter a three-letter word"
3060 PRINT"and the computer analyses it. If it is"
3070 PRINT"the correct word it gives you the number"
3080 PRINT"of goes it took you.
3085 PRINT:PRINT"Press any key to continue."
3086 GETR$:IFR$=""THEN3086
3090 PRINT"If the word is not correct then it is":USR(62)
3100 PRINT"placed in one of two columns: an ODD
3110 PRINT"column or an EVEN column, depending"
3120 PRINT"on the number of letters of your guess"
3130 PRINT"that exactly coincide with the letters"
3140 PRINT"of the target word."
3150 PRINT"If one letter is right (AND IN THE RIGHT"
3160 PRINT"PLACE) then the word goes in the ODD
3170 PRINT"column. If no letters coincide or two
3180 PRINT"letters coincide then it goes in the
3190 PRINT"EVEN column."
3195 PRINT:PRINT"Press any key to continue."
3196 GETR$:IFR$=""THEN3196
3200 PRINT"For instance, if the computer's word":USR(62)
3210 PRINT"was RED and you guessed DEN then the
3220 PRINT"word goes in the ODD column (only one
3230 PRINT"letter right and in the right place)."
3300 PRINT"If you make a mistake press SPACE to
3310 PRINT"clear the entry."
3320 PRINT"Remember you should enter words only
3330 PRINT"but no check is made, so no cheating!
3350 PRINT"Press any key to continue."
```

PROGRAMS

```
3360 GETW$:IFW$=""THEN3360
3370 PRINT"ØWait a few seconds please."
3380 RETURN
3999 REM**ANALYSIS OF PERFORMANCE
4000 IFGO<6THENC$="Incredible...I don't believe it!!!!!!!"
4010 IF(GO>5)*(GO<10)THENC$="Well done! A commendable effort!"
4020 IF(GO>9)*(GO<20)THENC$="Pretty good! Shows some promise."
4030 IF(GO>19)*(GO<35)THENC$="Not very good, concentrate next time!"
4040 IF(GO>34)*(GO<50)THENC$="Terrible!! Recommended reading: Janet & ØJohn."
4050 IFGO>49THENC$="Obviously you are not of human intellect"
4060 PRINT"ØThis is the analysis of your performance"
4080 PRINTC$
4090 RETURN
5000 PRINT"ØYou've had so many goes you're obviuosly"
5010 PRINT"not playing the game sensibly."
5020 PRINT"ØPlese try again."
5050 GOTO2030
```

NEWBRAIN PATIENCE

by J Swede

'Patience' is a simple version of 'one foundation' patience. Written in ANSI Basic and relying on strings rather than graphics, it should be a straightforward task to convert it to other machines.

Since there's nothing new I can say about a game of patience, I'll simply explain the PUT statements for the benefit of people converting the program:

PUT 31 clears the screen (CLS or HOME on most machines);

PUT 22,x,y positions the cursor at column x, line y;

PUT 22,x,y,z prints CHR$(z) at (x,y);

PUT 11 moves the cursor up one line (try PRINT CHR$(11);

PUT 2 deletes the current line (this is used to erase error messages — you'll probably have to overwrite with spaces on other machines).

```
10 OPEN#0,0,*100*:CLOSE#1:OPEN#1,5:PUT31:□IMa$(52),x(35),y(35):RESTORE:FORp=1TO3
5:READx(p),y(p):NEXTp:GOSUB220
20 RANDOMIZE:b$="A♠2♠3♠4♠5♠6♠7♠8♠9♠T♠J♠Q♠K♠A♥2♥3♥4♥5♥6
♥7♥8♥9♥T♥J♥Q♥K♥A♦2♦3♦4♦5♦6♦7♦8♦9♦T♦J♦Q♦K♦A♣2♣3♣4♣5♣6♣7♣8♣9♣T♣J♣Q♣K♣A*:FORp=1TO52:r=INT(RND*LEN(b$)/2)*2+1:a
$(p)=MID$(b$,r,2):b$=LEFT$(b$,r-1)+MID$(b$,r+2):NEXTp
30 FORp=1TO35:PUT22,x(p),y(p):?a$(p):NEXTp:FORp=1TO7:PUT22,p*5+1,1,48+p,22,p*5+1
,15,48+p:NEXTp:FORp=36TO52:aa$=a$(p):IFp=52PUT22,11,21:?*THIS IS THE LAST CARD*
40 PUT22,10,17:?*YOUR CARD IS THE *;LEFT$(aa$,1);* OF *;MID$(aa$,2)
50 PUT22,15,19:?*WHICH COLUMN?*:GET#1,c:IFc<49ORc>55THENIFc<>100THENIFc<>101PUT2
2,10,19:?*A NUMBER BETWEEN 1 AND 7*:PUT22,9,20:?*OR d FOR DEAL, OR e TO END*:FOR
1=1TO1000:NEXT1:PUT11,2,11,2:GOTO50
60 IFc=100THEN90
70 IFc=101THEN200
80 c=c-20:GOSUB100:GOTO40
90 NEXTp:GOTO200
100 IFa$(c)=**THENIFc>7THENc=c-7:GOTO100
110 a=ASC(LEFT$(aa$,1)):GOSUB140:d=b:a=ASC(LEFT$(a$(c),1)):GOSUB140
120 IFd=b+10Rd=b-1PUT22,x(c),y(c),32,32:aa$=a$(c):a$(c)=**:RETURN
130 PUT22,15,19:?* WRONG COLUMN*:FOR1=1TO1000:NEXT1:GOTO50
140 b=a:IFa=65THENb=49
150 IFa=84THENb=58
160 IFa=74THENb=59
170 IFa=81THENb=60
180 IFa=75THENb=61
190 RETURN
200 PUT22,10,21:?*DO YOU WANT ANOTHER GAME?*:PUT22,13,22:?*PLEASE TYPE y OR n*:G
ET#1,a:IFa=121PUT11,2,11,2:GOTO20
210 CLOSE#1:END
220 PUT22,9,4:?*DO YOU WANT INSTRUCTIONS?*:PUT22,13,6:?*PLEASE TYPE y OR n*:GET#
1,a:IFa=121THEN?:?*THE OBJECT OF THE GAME IS TO REMOVE THE*:?*TOP CARD FROM ANY
OF THE SEVEN COLUMNS*:?*AND PLACE IT ONTO THE FOUNDATION PILE*:?*IN SUCH A WAY T
HAT THE NUMERICAL VALUE*:?*OF THE CARD IS EITHER ONE ABOVE OR ONE*:?*BELOW THAT
CURRENTLY ON TOP OF THE*:?*FOUNDATION PILE.*:?:?*SHOULD A MOVE BE IMPOSSIBLE, PR
ESS d TO*:?*DEAL A NEW CARD FROM THE REMAINDER, OR*:?*PRESS e TO END THE GAME AT
 ANY TIME.*:?:?*   PRESS ANY KEY TO PLAY THE GAME*:GET#1,a
230 PUT31:RETURN
240 DATA5,4,10,4,15,4,20,4,25,4,30,4,35,4,5,6,10,6,15,6,20,6,25,6,30,6,35,6,5,8,
10,8,15,8,20,8,25,8,30,8,35,8,5,10,10,10,15,10,20,10,25,10,30,10,35,10,5,12,10,1
2,15,12,20,12,25,12,30,12,35,12
```

SPECTRUM JACKPOT

by D C Hawkins

'Jackpot' is a fruit machine program for a 16 or 48k Spectrum.

The program is short and simple, the graphics leaving little free memory on a 16k machine. Owners of 48k machines may like to add other facilities such as a 'nudge' feature.

The wheels are spun by pressing 0 (zero), and held — when the HOLD option is available — by pressing 1, 2 and/or 3 to hold the respective wheel/s. Although simple, the children who tested it (aged nine) enjoyed it and that's what counts.

As the program stands, the odds are stacked in the player's favour. To alter the odds against the hold facility, change the value of three in line 320; to alter the odds against a jackpot, change the value five in 1080.

```
  2 REM  FRUIT MACHINE
  4 REM © D.C.Hawkins 1983
  6 BORDER 2
  8 PRINT AT 16,3;"++++++++++++
++++"
 10 PRINT AT 1,3;"++++++++++++++
+++"
```


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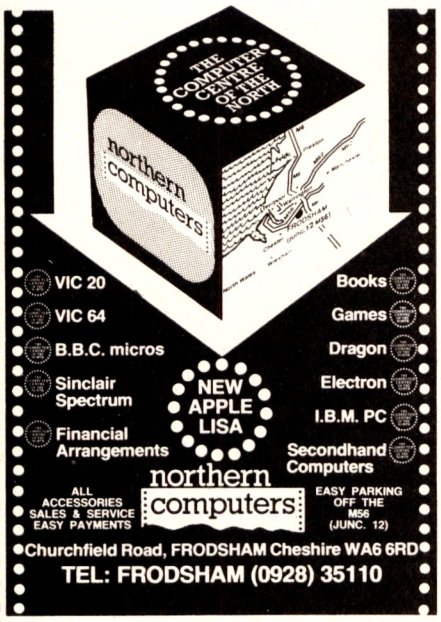
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PROGRAMS

```
  12 FOR n=2 TO 15: PRINT AT n,3
;"+": PRINT AT n,18;"+": NEXT n
  14 PRINT AT 7,5;"------------"
  16 PRINT AT 10,5;"------------
"
  18 PRINT AT 6,20;"SCORE": LET
sc=0
  20 PRINT AT 19,3;"PRESS 0 TO R
UN": PRINT AT 20,3;"PRESS 9 TO C
ANCEL HOLD"
  28 FOR i=97 TO 112: PRINT AT 0
,ABS ((104-i)*2)+3;"©": BEEP .01
25,0: FOR n=0 TO 7
  30 PRINT AT 0,ABS ((104-i)*2)+
3;" ": READ x: POKE USR CHR$ i+n
,x
  32 NEXT n: NEXT i
  34 DIM j(18,18)
  36 DIM k(15): DIM l(15): LET l
(5)=1: LET l(10)=2: LET l(15)=3
  38 LET p=5: LET q=15: LET r=5
  40 BEEP .0125,40: BEEP .0125,4
0: BEEP .0125,40: PRINT AT 15,22
;"      ";AT 17,5; INK 1;"1    2
  3": LET sc=sc-10: PRINT AT 9,2
0;"      ";AT 9,20;sc
  50 FOR x=p TO q STEP r
  55 LET k(x)=INT (RND*5)+1
  60 IF k(x)=l(x) THEN GO TO 55
  65 LET l(x)=k(x): LET y=3*k(x)
  70 INK 4: LET j(y,x)=1: BEEP .
01,-10
  75 PRINT AT y,x;"▀"
  80 PRINT AT y-1,x;"▄"
  85 IF y=15 THEN LET y=0
  90 INK 2: LET j(y+3,x)=2: BEEP
 .01,-10
  95 PRINT AT y+3,x;"▀"
 100 PRINT AT y+2,x;"▄"
 105 IF y=12 THEN LET y=-3
 110 INK 6: LET j(y+6,x)=3: BEEP
 .01,-10
 115 PRINT AT y+6,x;"▀"
 120 PRINT AT y+5,x;"▄"
 125 IF y=9 THEN LET y=-6
 130 INK 2: LET j(y+9,x)=4: BEEP
 .01,-10
 135 PRINT AT y+9,x;"▀"
 140 PRINT AT y+8,x;"▄"
 145 IF y=6 THEN LET y=-9
 150 INK 3: LET j(y+12,x)=5: BEE
P .01,-10
 155 PRINT AT y+12,x;"▀"
 165 PRINT AT y+11,x;"▟▙"
 170 NEXT x
 300 LET p=5: LET q=15: LET r=5:
 PRINT AT 15,22;"      ";AT 17,5;
INK 1;"1    2    3"
 305 LET a1=0: LET a2=0: LET a3=
0
 310 IF j(9,5)=j(9,10) AND j(9,1
0)=j(9,15) THEN GO SUB 1000
 320 IF INT (RND*3)<2 THEN GO TO
 380
 325 BEEP .05,10: PRINT FLASH 1;
AT 15,22;"HOLD"
 335 IF INKEY$="0" THEN GO TO 80
0
 340 IF INKEY$="9" THEN LET a1=0
: LET a2=0: LET a3=0: PRINT AT 1
7,5; INK 1;"1    2    3"
 345 IF INKEY$="1" THEN LET a1=1
: PRINT AT 17,5; INK 1;"H": BEEP
 .05,20: PAUSE 20
 350 IF INKEY$="2" THEN LET a2=1
: PRINT AT 17,10; INK 1;"H": BEE
P .05,27: PAUSE 20
 355 IF INKEY$="3" THEN LET a3=1
: PRINT AT 17,15; INK 1;"H": BEE
P .05,34: PAUSE 20
 360 GO TO 335
 380 IF INKEY$="0" THEN GO TO 40
 400 GO TO 380
 800 IF a1=1 AND a2=1 AND a3=1 T
HEN BEEP .0125,40: BEEP .0125,40
: BEEP .0125,40: GO TO 300
 805 IF a1=1 AND a2=1 THEN LET p
=15: GO TO 40
 810 IF a2=1 AND a3=1 THEN LET q
=5: GO TO 40
 815 IF a1=1 AND a3=1 THEN LET p
=10: LET q=10: GO TO 40
 820 IF a1=1 THEN LET p=10: GO T
O 40
 825 IF a2=1 THEN LET r=10: GO T
O 40
 830 IF a3=1 THEN LET q=10: GO T
O 40
 835 GO TO 40
1000 FOR n=7 TO 2 STEP -1: BORDE
R n: PAUSE 10: NEXT n: FOR n=-7
TO 7 STEP .5: BEEP .02,49-n*n: N
EXT n
```

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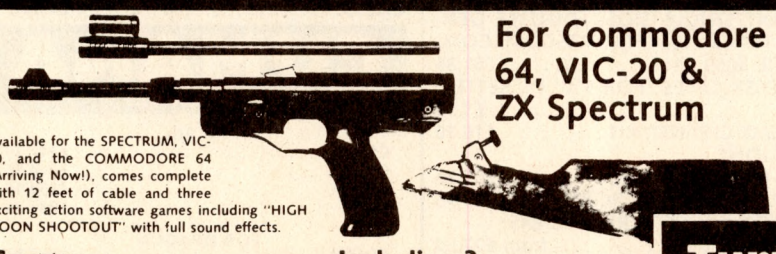
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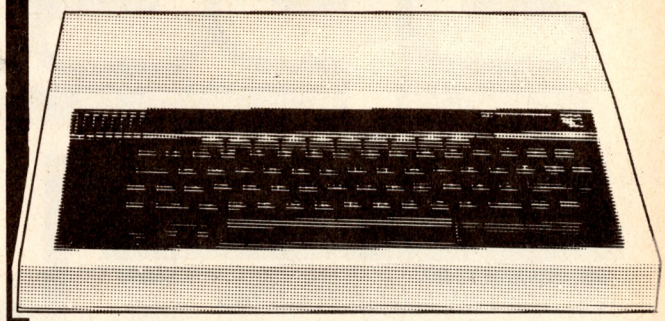
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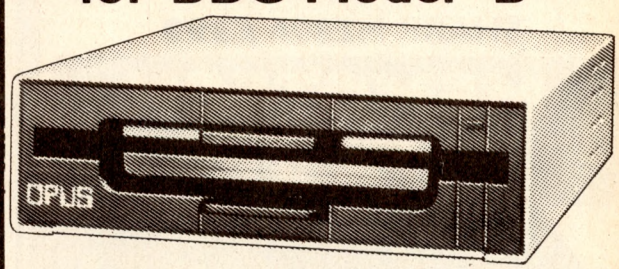
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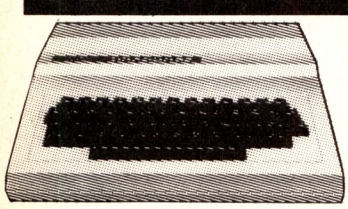
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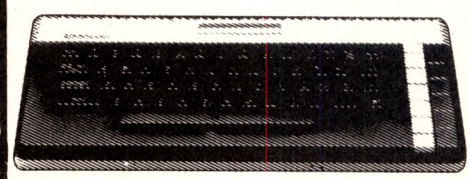
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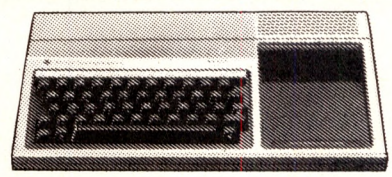
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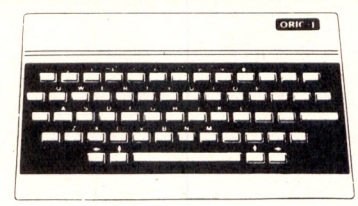
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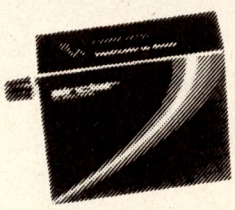
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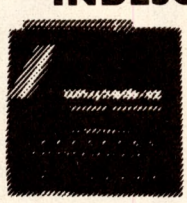
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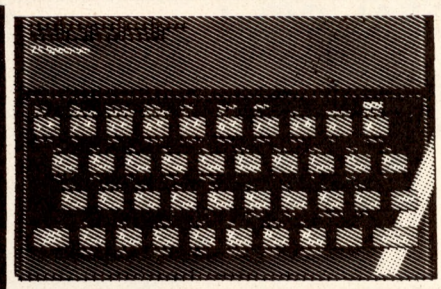
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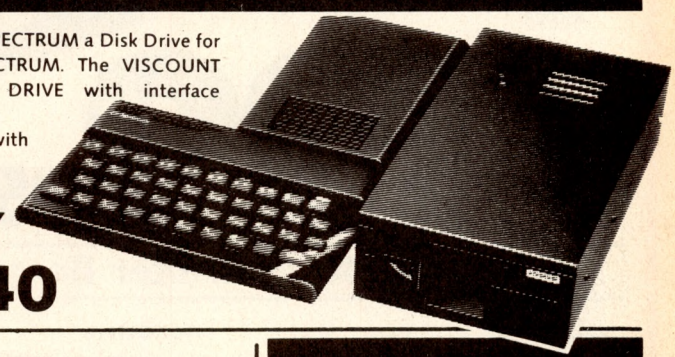
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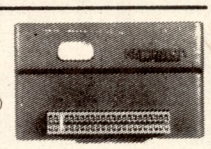


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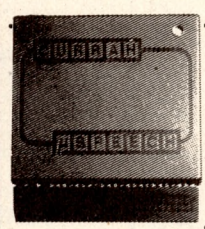
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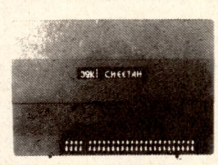


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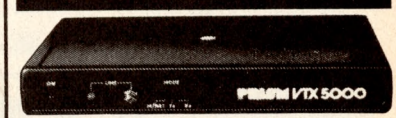
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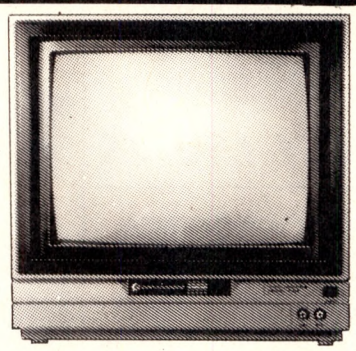
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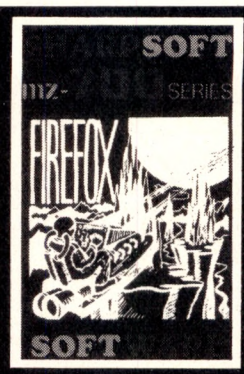
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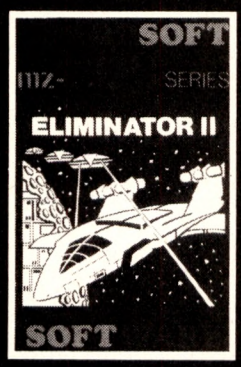
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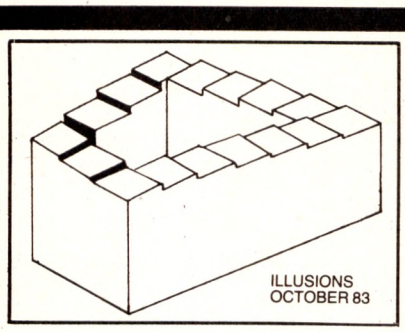




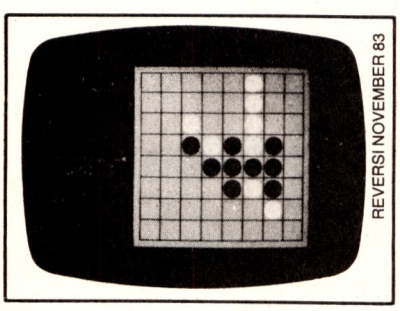
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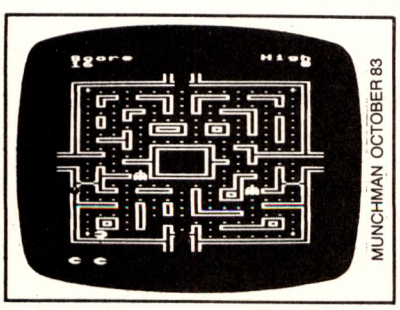
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December Issue: Program Features: **Killer Dice** game, **Galactic Invasion,** a fast moving space invasion game, **LINK,** a very useful disc utility for program development, **ASTAAD,** really excellent program for **Computer Aided Design,** the **Percussion Machine,** moving **Chequer Board** display, **Screen Freezer,** a routine to freeze your favourite game in mid-play, and a musical rendering of the **Twelve Days of Christmas** to add a seasonal flavour. Plus articles on the **Teletext Mode** (part 3) and **Fitting an External Speaker.** Plus **Disc Drive Reviews, Book Reviews,** Hints and Tips.

Jan/Feb Issue: Program Features: **Block Blitz**, an excellent arcade style game, **A Disassembler** for the BBC Micro, **the Raybox** game, test your powers of deduction, large digital display in mode 7, and **Dancing Lines**, an interesting visual demonstration of random numbers. Plus articles on **Machine Code Graphics**, the first of an introductory series. **Teletext Mode** (Part 4) with a set of useful procedures, protecting your own programs, and an introduction to **Forth**. Plus review of double density disk controllers, graphics tablet and new software, Product news, Post bag, Hints and Tips.

STOP PRESS
BEEBUG has negotiated a deal with ACORN over the new 1.2 OPERATING SYSTEM ROM. BEEBUG members are offered the ROM at around half-price. See BEEBUG Feb. issue for details.

SOFTWARE DETAILS

BEEBUGSOFT : BEEBUG SOFTWARE LIBRARY
offers members a growing range of software from £3.50 per cassette. 1. Starfire (32K). 2. Moonlander (16K). 3D Noughts and Crosses (32K). 3. Shape Match (18K). Mindbender (16K). 4. Magic Eel (32K). 5. Cylon Attack (32K). 6. Astro-Tracker (32K). **Utilities**: 1. Dissembler (16K). Redefine (16K). Mini Text Ed (32K). **Applications**: 1. Superplot (32K). 2. Masterfile (32K).

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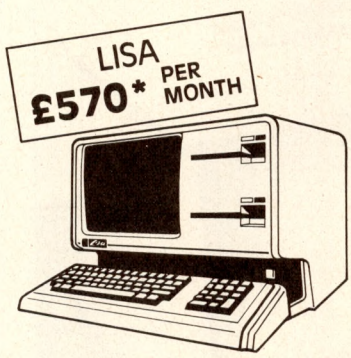
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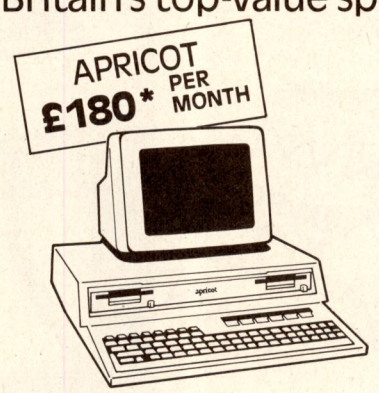
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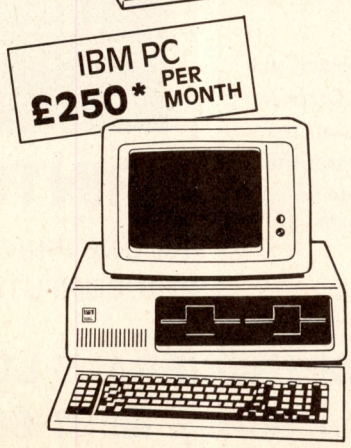
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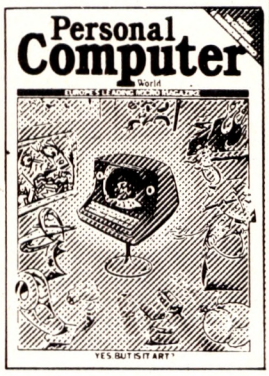
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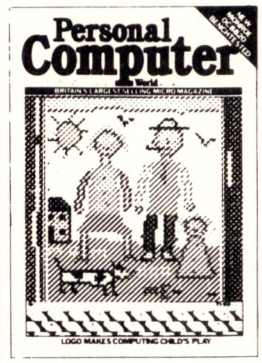


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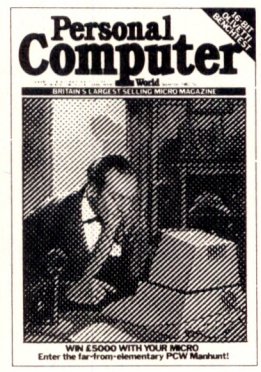


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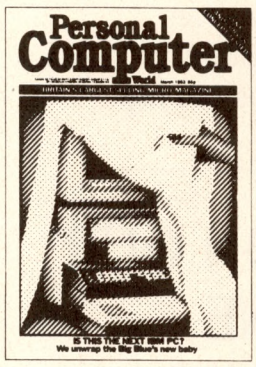


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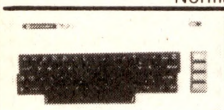
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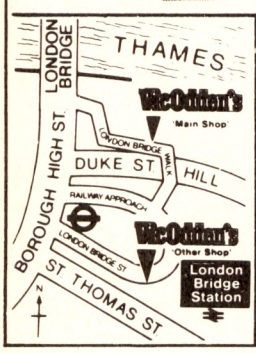


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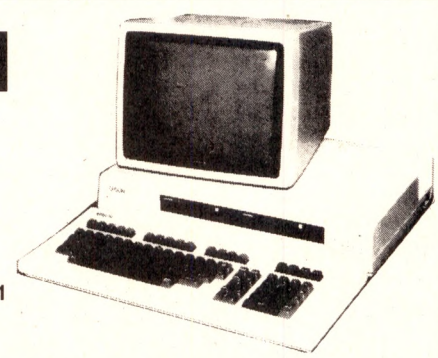
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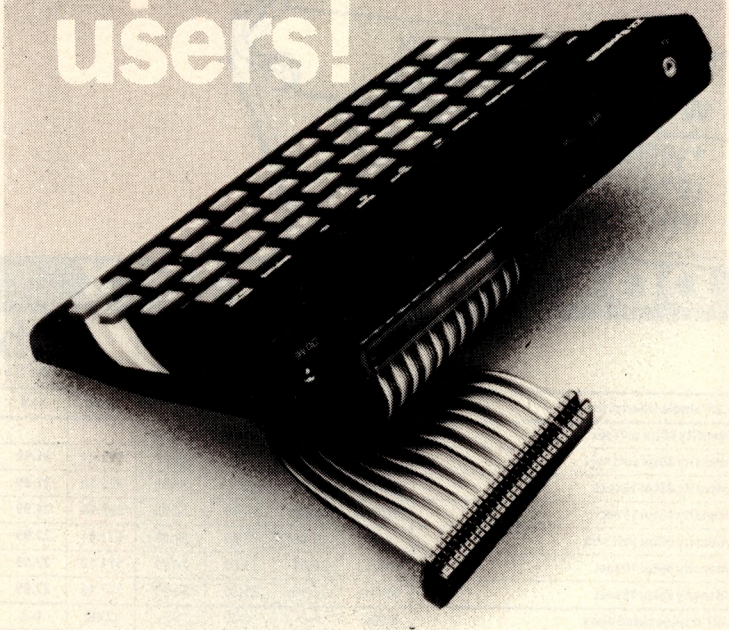
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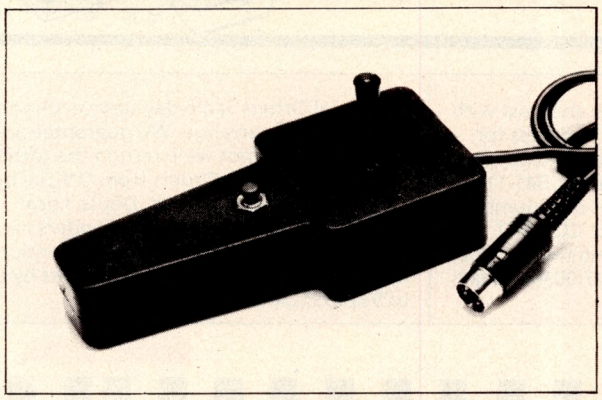
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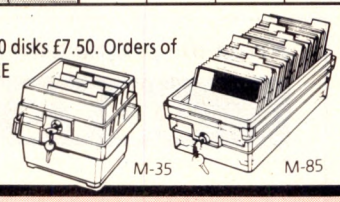
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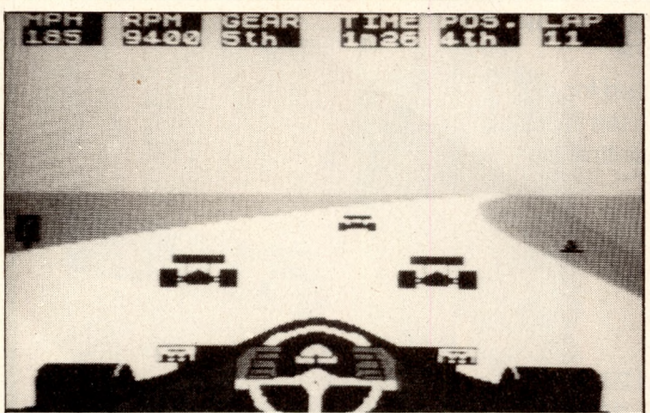
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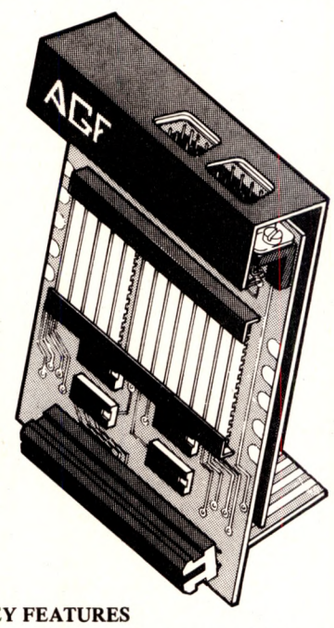
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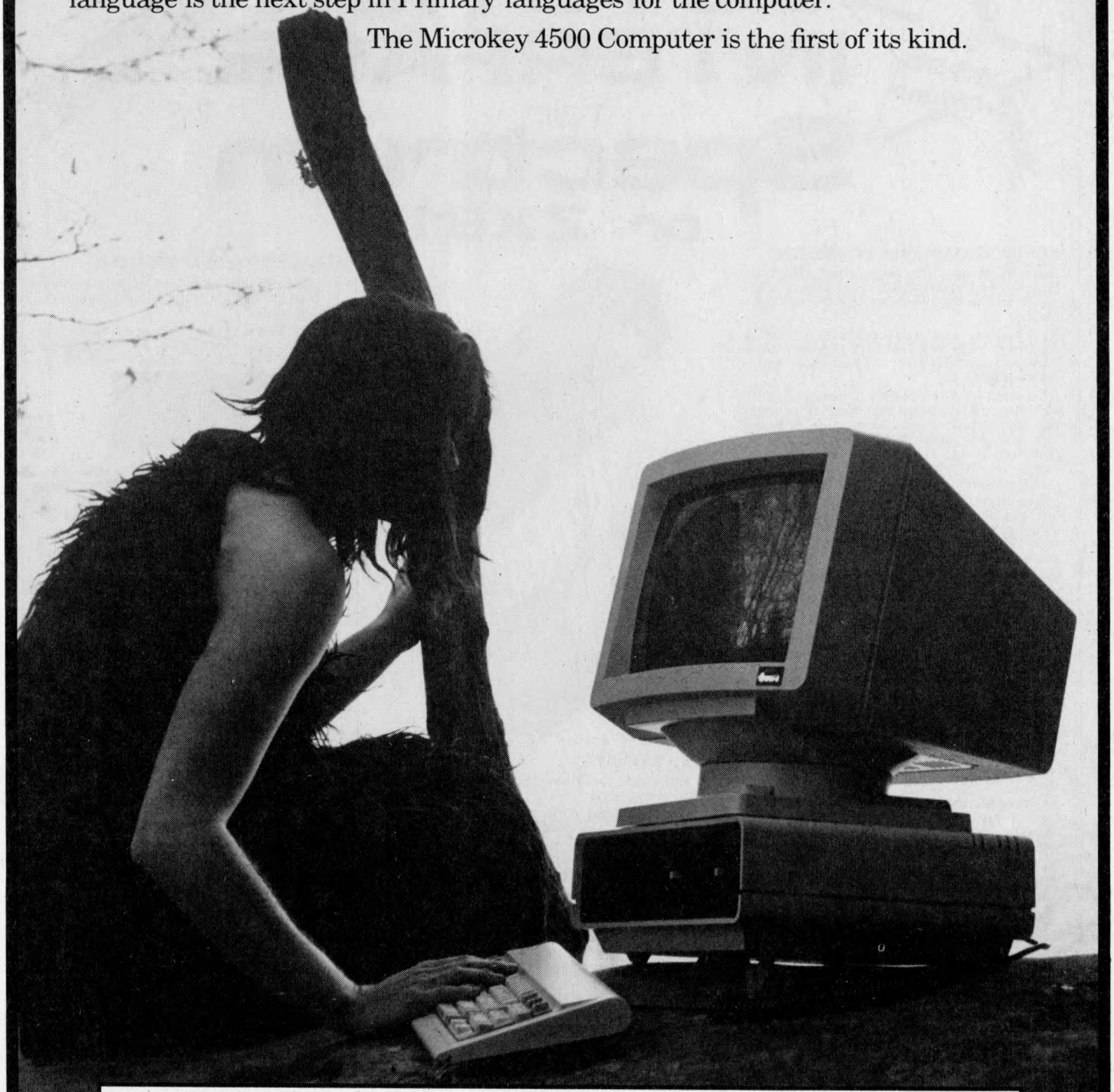
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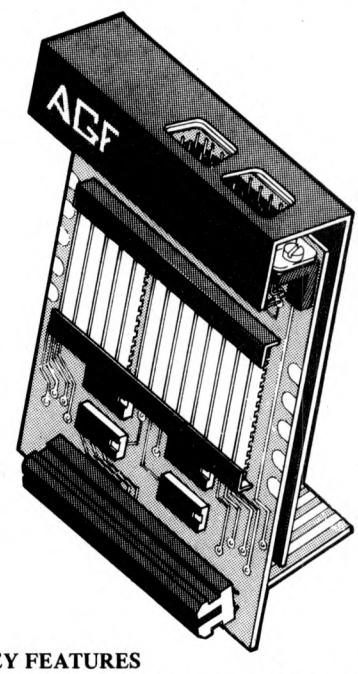
Programming is achieved by a two-digit code, which is looked up on the Programming Chart supplied, for each direction and firing button. These two numbers are then selected on a pair of leads which are clipped onto appropriately numbered strips on the interface.

Once configured this can be marked onto a Quick Reference Programming Card for storing with the game. As the programming is *not* power dependent the interface can be immediately used when next switched on.

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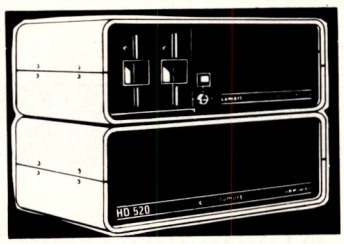
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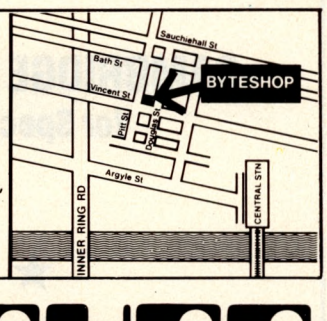
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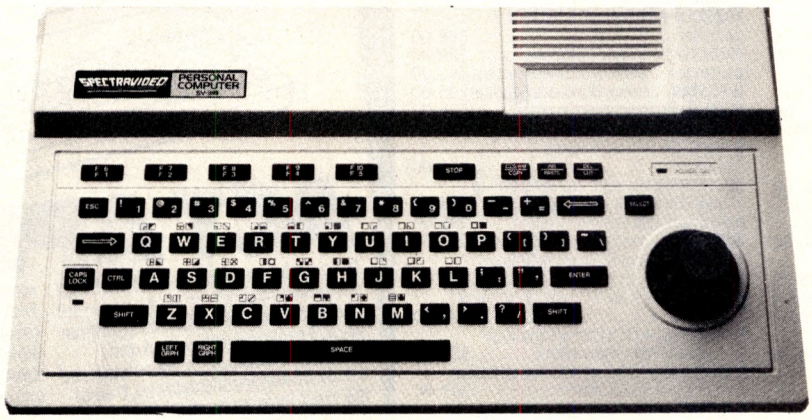
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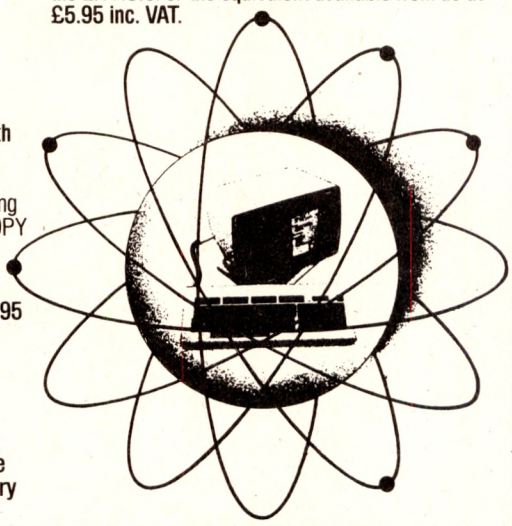
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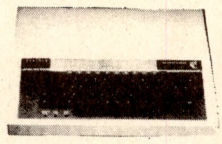
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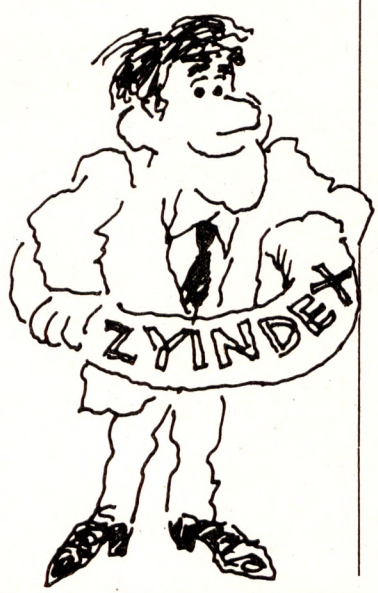
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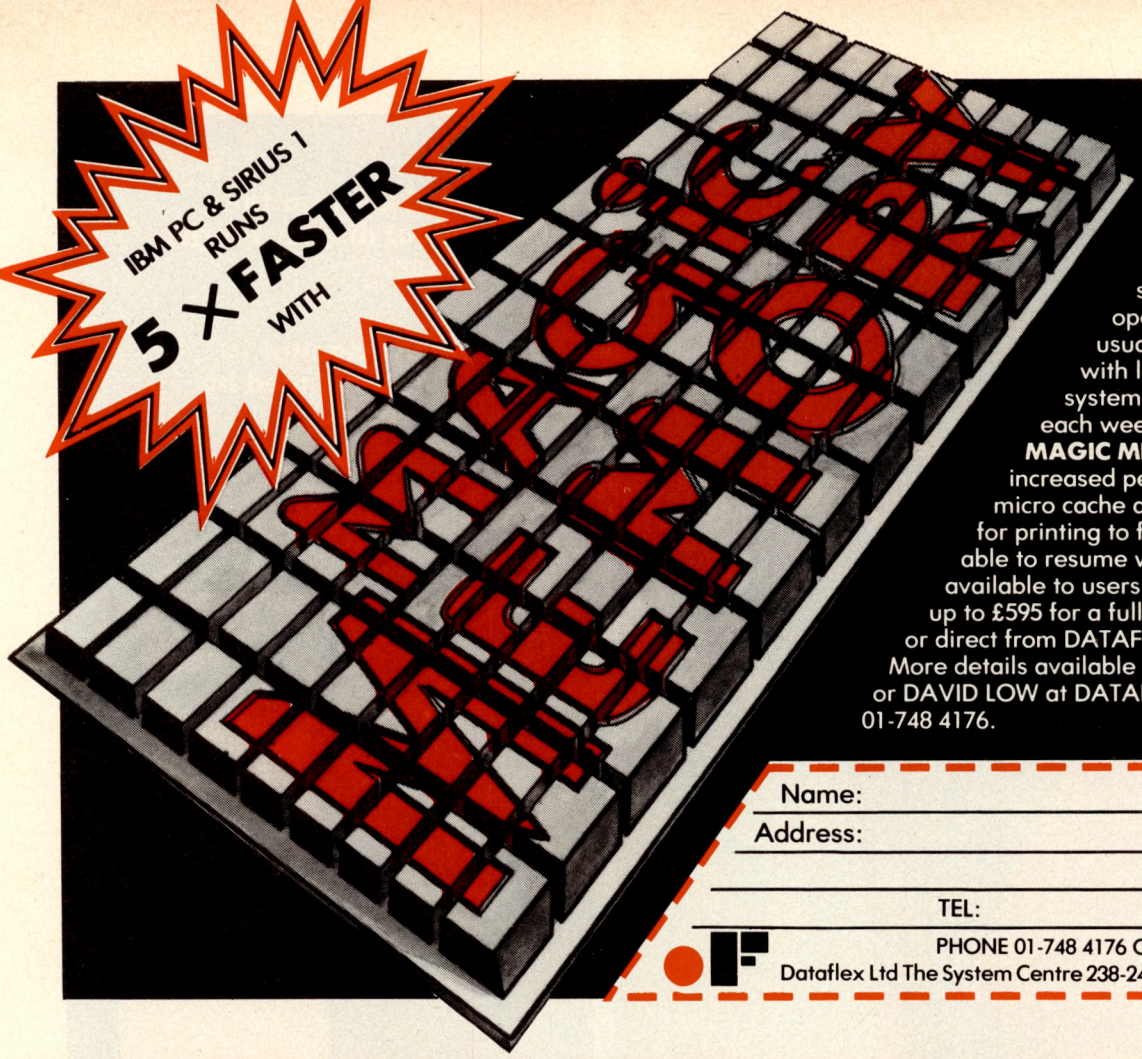
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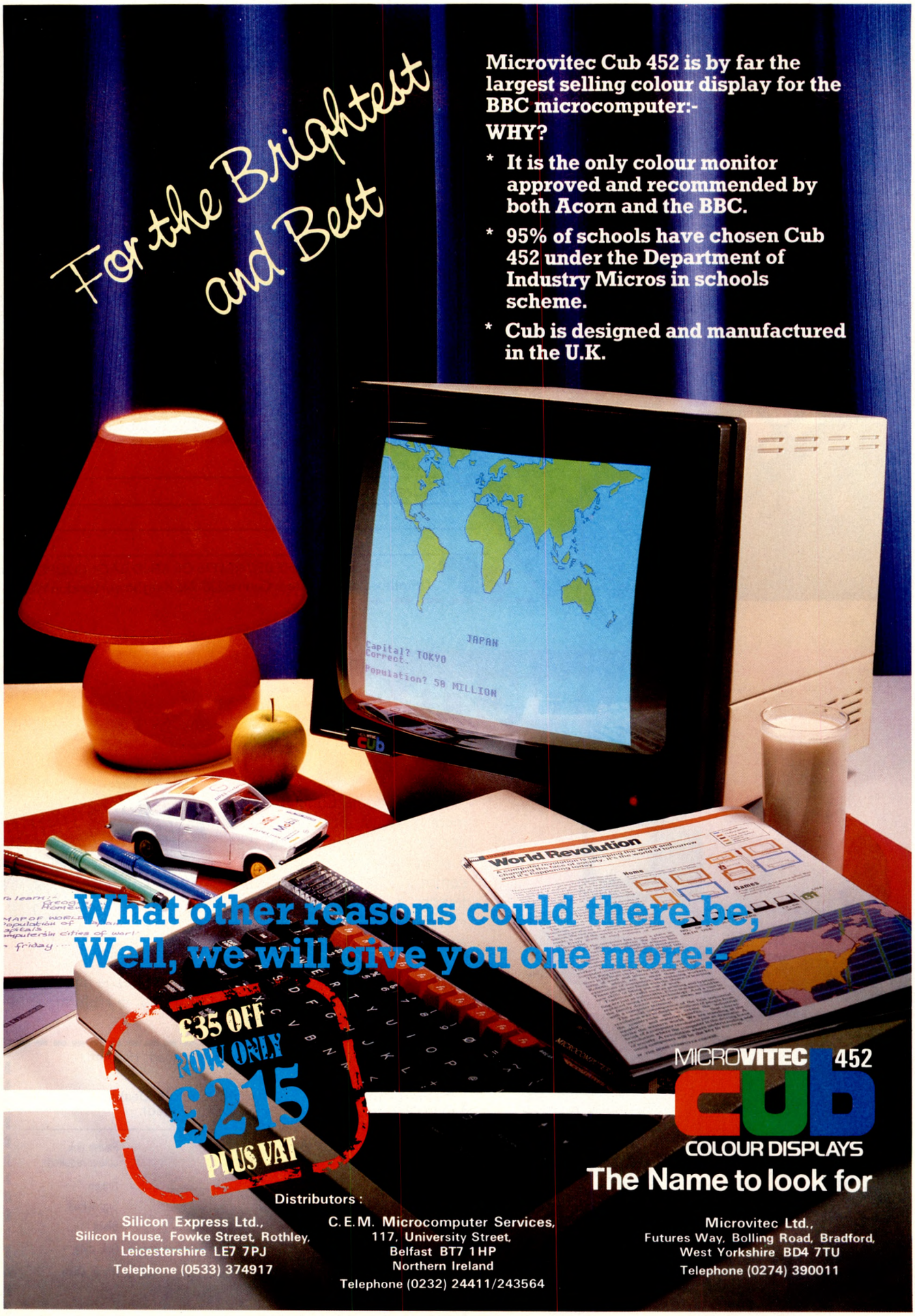
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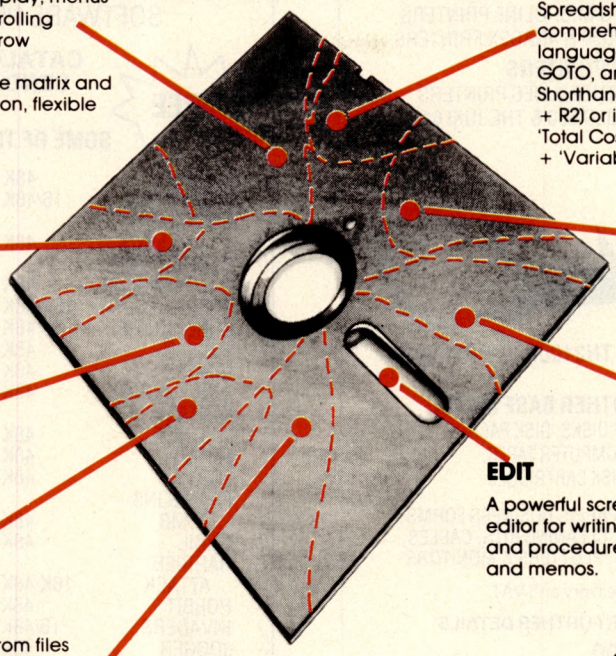

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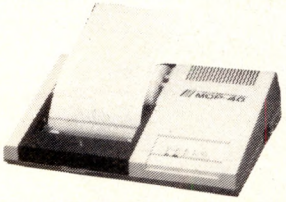
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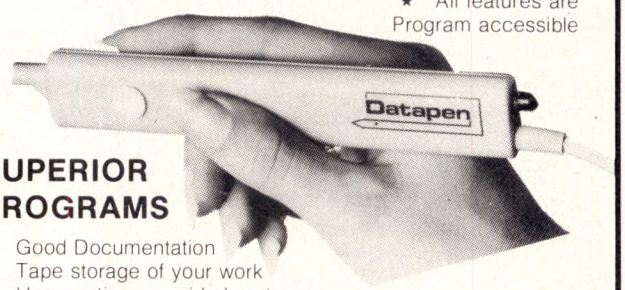
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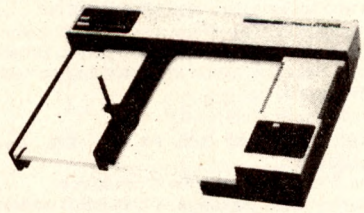
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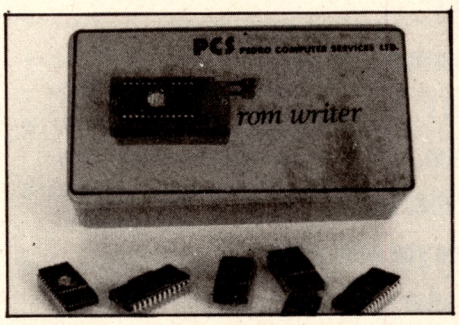
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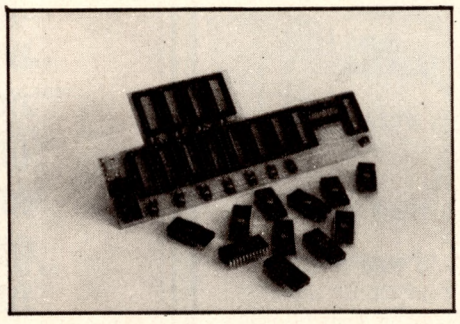
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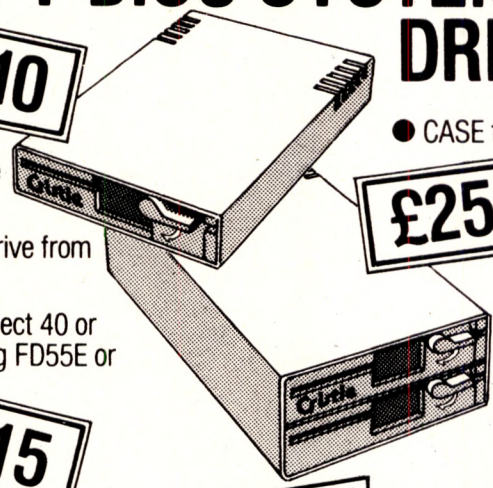
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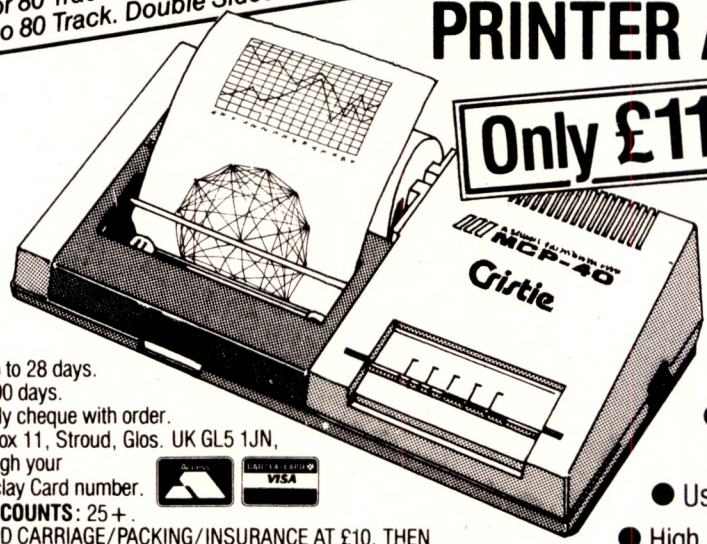
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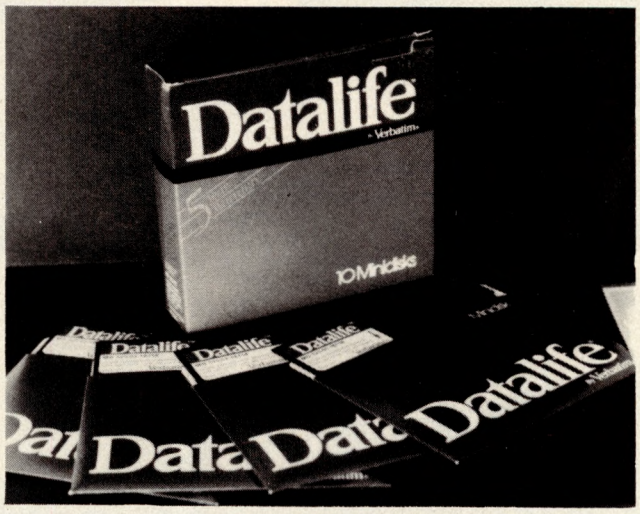
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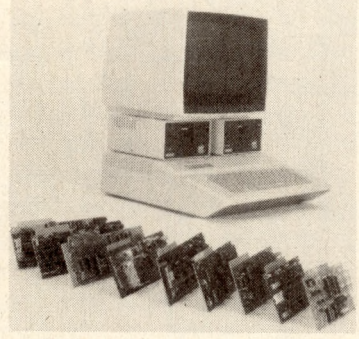
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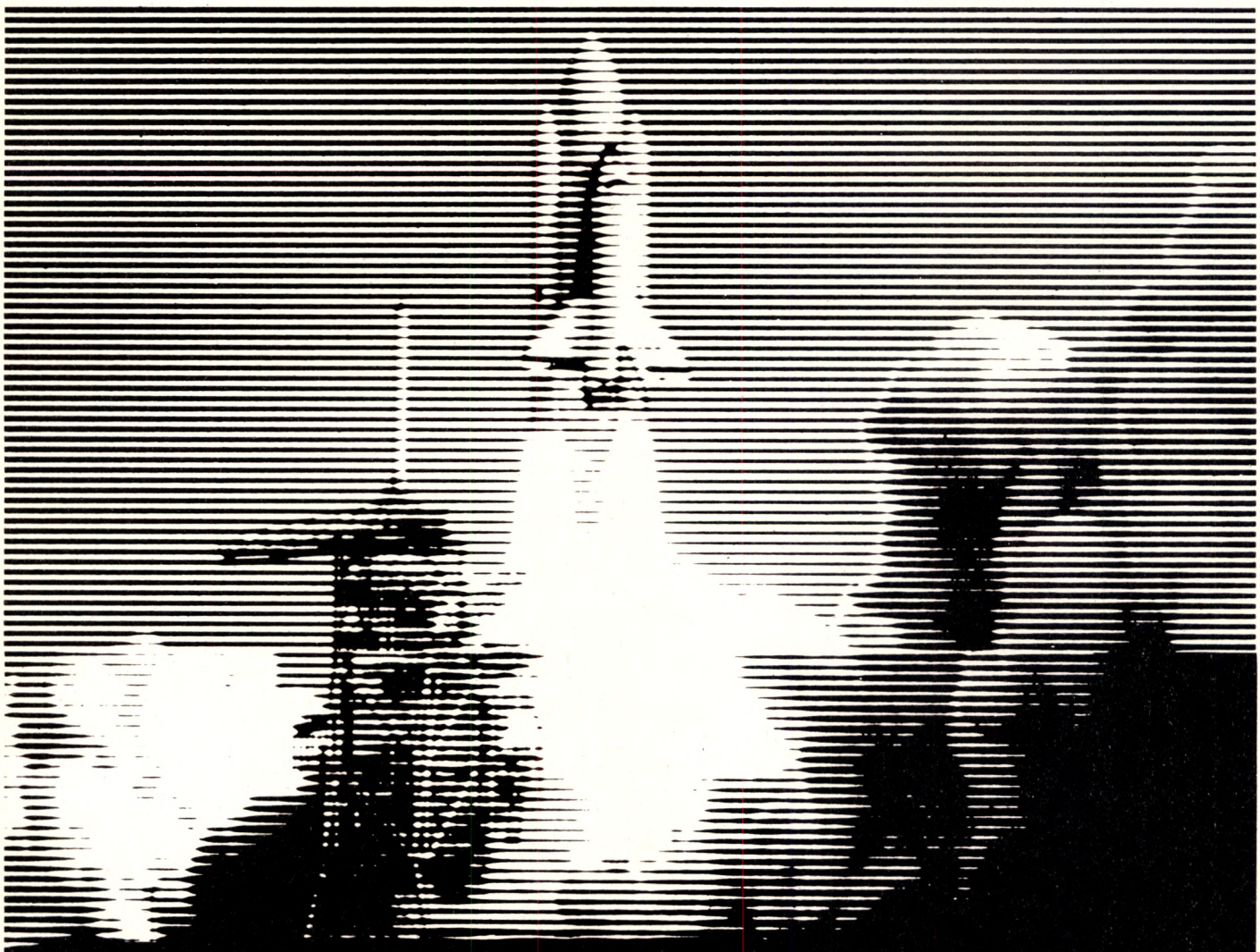
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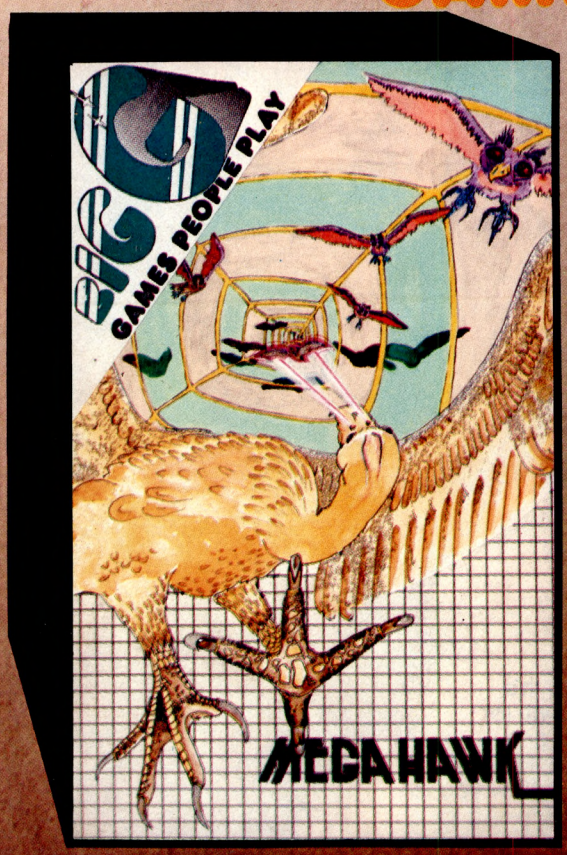
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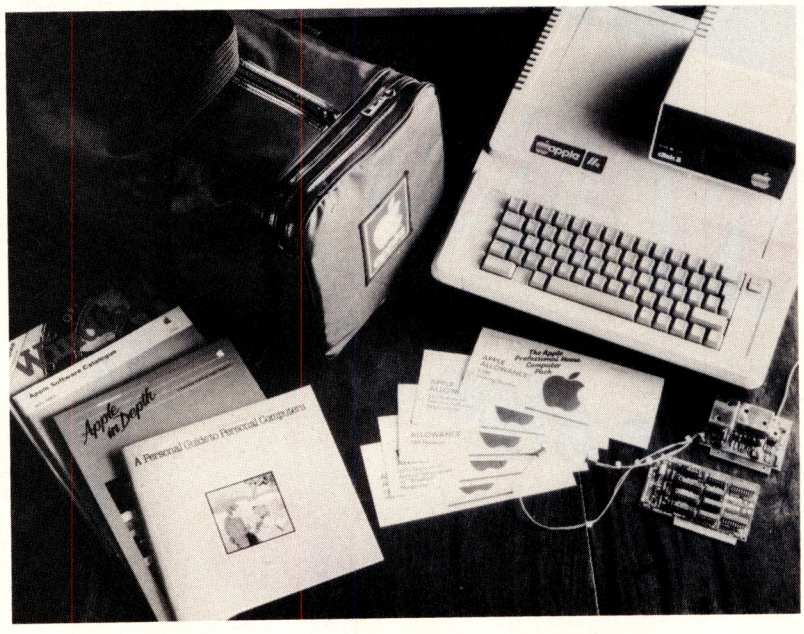
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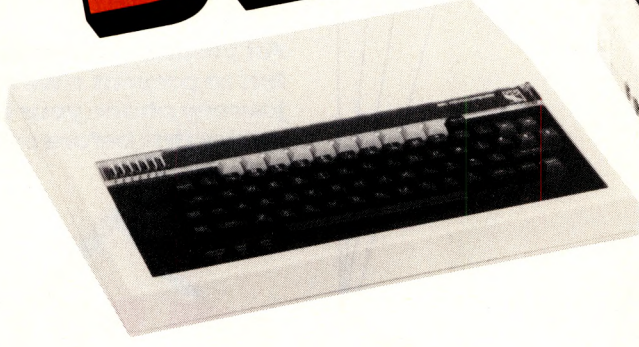
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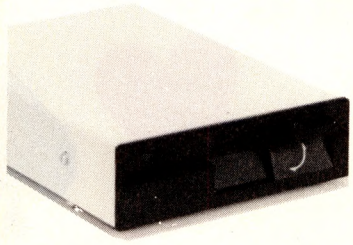
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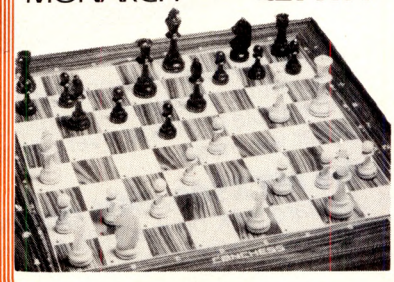
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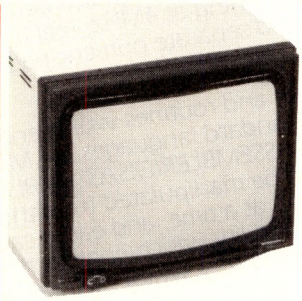
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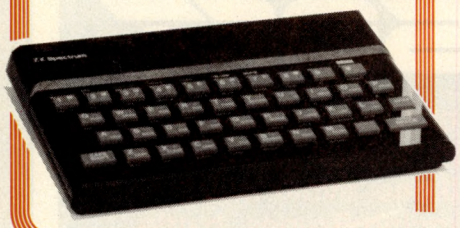
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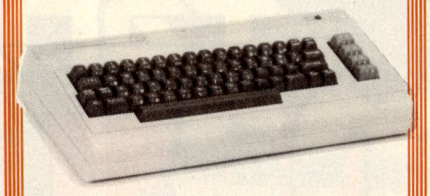
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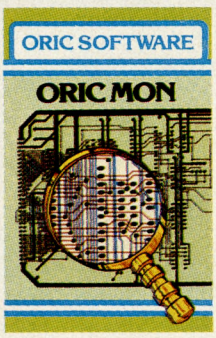
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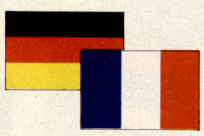
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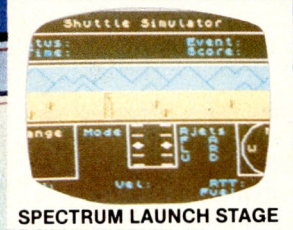
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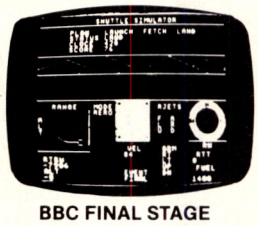
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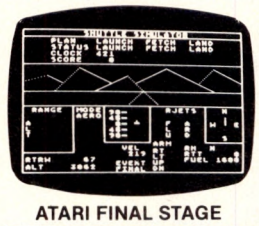


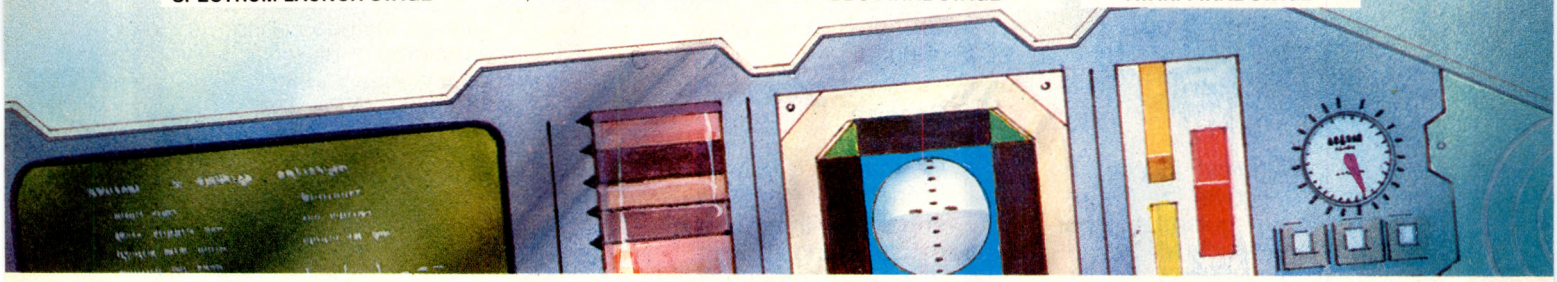
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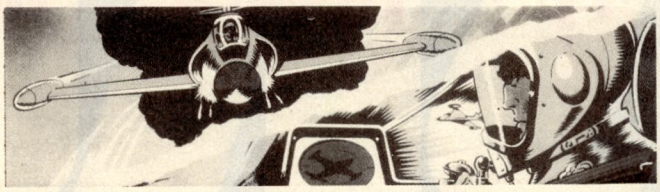
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S·C·R·E·E·N·P·L·A·Y

City-destroying monsters, claustrophobic cars and wizards engaged in magical duels are conjured up this month for the Oric, Spectrum, Dragon 32 and Atari machines.











ULTIMA ZONE

Supplier: Tansoft
Computer 48k Oric
Price: £8

After a very slow start it now seems that Oric software is starting to match the machine's capabilities — and about time, too!

Ultima Zone is a trilogy of programs for the 48k Oric that, without being terribly original, at least shows off the computer's sound and graphics to good advantage.

Stage 1 is the 'Battlezone'; here you control a laser base, Space Invaders style, and must demolish the various craft pitted against you. Main attackers are the Walkons, which release Brunes. The Walkons attack from a 'safe box' at the top of the screen and the various Brunes, fireballs and bombs bounce around the playing area — the Brunes will bounce off the bottom of the screen and hit you from behind, so it is imperative that you keep an eye open for sneak attacks from the rear. In addition to your lasers, a shield effect will help ward off these nasties.

Stage 2 introduces the Henk-class cruiser; this is a large object that is manipulated by hits from your laser — hit the Henk's left panel to move the cruiser up, the right panel to move it down, and the centre panel to fire at the Brunes. There is a time limit in which to destroy all the Brunes and a bonus score is awarded if this is done before the timer runs out.

Stage 3 is a type of Space Frogger. In this stage you have no armament as such — instead you must pilot your Sheamus-2 missile through the various obstacles to reach the Walkon spy satellites. You may move from side to side by pressing the CTRL and 'A' keys, and you may increase your speed by means of the Return key. Wipe out one satellite and another appears — only this time everything moves at a much greater speed.

The presentation of Ultima Zone is extremely good — there's a loading screen that keeps you informed of what is happening during the many minutes it takes to load this game at the slow setting, and the instructions on the cassette inlay are very clear. For the real novice there is even a step-by-step guide giving full details of how to load any Oric cassettes. The graphics are very smooth in operation and the controls are easy to manipulate. My only quibble is that it would have been nice to have a volume control — the Oric has a wide volume range and it would have been better if Ultima Zone left the choice to the user instead of simply having the sound set on or off. But that's a minor point: this is one of only a few good games for the Oric I have seen so far.

Presentation	**90%**
Addictive quality	**60%**
Use of graphics	**80%**
Value for money	**80%**







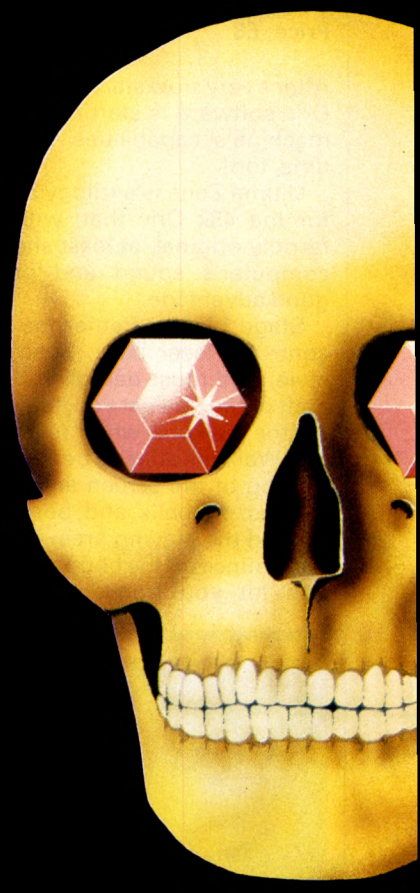
BLUE MAX

Supplier: Synapse Software
Computer: Atari 400/800 (32k)
Price: £24.95

You smile grimly to yourself but then it's 'CHOCKS AWAY' and you're off on another raid behind enemy lines, for you are Max Chatsworth, the infamous 'Blue Max'. Your mission, as always, is to bomb the enemy's buildings and bridges while shooting down as many of its planes as possible. Be warned however: the huns are determined to shoot you down and thereby win the

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highest Axis award. An award which carries your name, the Blue Max. It is awarded to the person who shoots you down.

Most of the screen display is an excellent graphic image of the area in which you are flying. The image is 3-D with your plane in the centre. The bottom of the screen contains the command bar with details of your speed, altitude, fuel remaining and your score.

You should try to keep at least one eye on this command bar at all times since it provides essential information. The command bar is usually white but will turn blue when you are at the same altitude as an attacking plane. Orange is the colour displayed when you are at the correct height for straffing enemy ground positions — for example, tanks and guns. Should the bar flash in bright orange then climb quickly because you are too low and are about to crash. Should you be hit by an enemy plane, gun or ship, then the bar will turn red and you will be told of the damage done by a permanently displayed letter code. 'F' means you have lost fuel and 'M' a loss in manoeuvrability, 'B' indicates that you can only bomb intermittently and 'G' is the same but for your machine guns. If all these letters are shown then the next hit will result in the destruction of your aircraft.

Your first mission is to destroy targets along a stretch of river and, should you require repairs, there is a friendly airstrip waiting for you. But beware, because the huns will bomb you as you are being refuelled and repaired.

There are certain primary targets which you must try and destroy; indeed you have to despatch a number of these before you can progress to the next stage. These include targetted buildings and bridges, blue airplanes, red ships and even some trucks.

The next *sortie* is inland and is an attack on an enemy airfield but what happens after that, I'm afraid, I've yet to discover.

When you are finally shot down, you will be given a rating starting at kamikaze trainee. My highest achievement was a class 1 air cadet. Obviously there are higher levels of achievement to be attained, and even an end to the game, but unfortunately all my attempts ended in smoke.

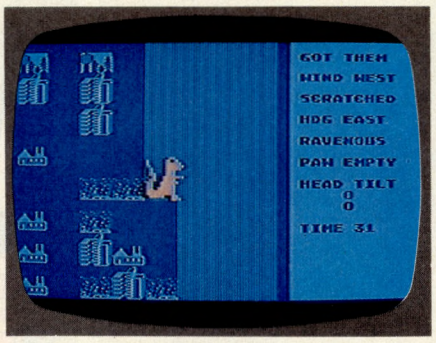
Incidentally a warning to prospective players of this superb game. You only get one place so take good care of it or your games will be brief.

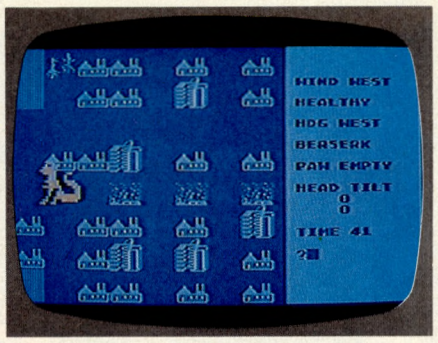
Should all this sound too easy I must mention that there's also an intermediate and advanced level of play and to make things really challenging you can introduce gravity.

The Blue Max tested was a cassette version which took a long time to load but it's also available on disk and cartridge.

Presentation	**60%**
Addictive quality	**90%**
Use of graphics	**100%**
Value for money	**70%**







CRUSH, CRUMBLE & CHOMP!

Supplier: Epyx
Computer: Atari 400/800 (32k)
Price: £24.80

Crush, Crumble and Chomp isn't the most subtle of titles, yet it is an accurate description of this monster game. The game is based on those truly awful films which involve a monster destroying a city. All the essential ingredients of a good game are included. You play the role of the monster terrifying the fleeing civilians. But beware! — for the National Guard has been called to attack you with troops, tanks and helicopters. There's even the obligatory mad scientist.

You can choose to be one of six different monsters: Goshilla the giant lizard, Kraken the giant squid, Mechismo the robot, Mantra the flying reptile, Arcanis the giant spider and a nameless, shapeless blob. If that choice isn't enough for you, you can even build a creature of your own design. This gives you an almost inexhaustible selection of different scenarios.

Once you have chosen which monster to be, you must decide which city to visit from a choice of Tokyo, San Francisco, New York and Washington.

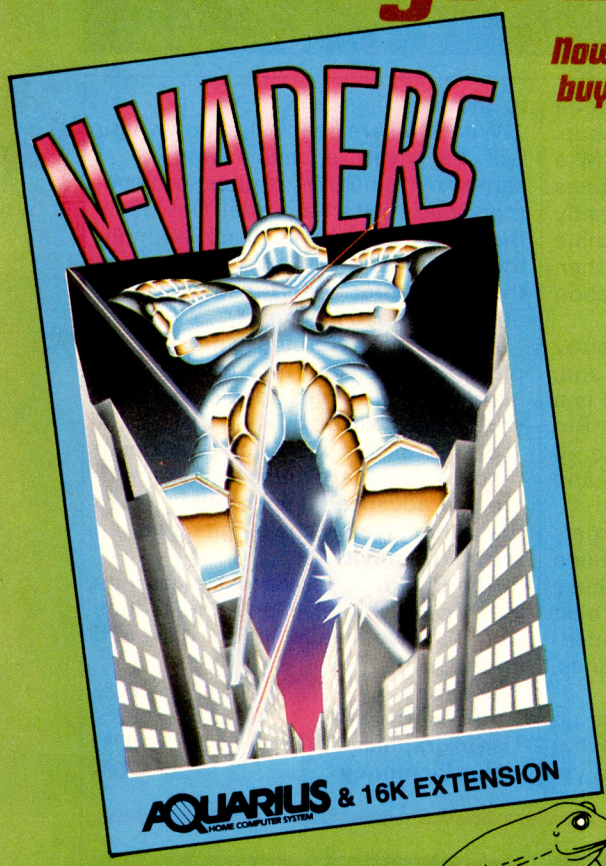
Having selected Kraken I decided that San Francisco would be the best hunting ground for a creature that can't leave the water. Full maps of all the towns are included in the rulebook and are particularly useful since only a sixteenth of the city under attack is displayed on the screen at any one time. This graphic display of the city occupies two thirds of the screen display and shows the buildings you are to crush and crumble and the people for you to eat. The rest of the screen contains information about the state of your monster. HDG is the direction in which you are going, Health is your physical condition and there are indicators which show if there is anything in your paw (to be eaten) and an indication of how hungry you are.

Hunger is the main source of trouble for monsters as they are ruled by their stomachs rather than their heads. If you, in your role of monster, do not eat enough people, tanks and helicopters you will get hungry and grow famished until finally you become berserk with hunger. Berserk is not a good state to be in because the monster loses control and is taken over by a need to eat. In such a state it is very easy to go from healthy monster to dead monster in a few seconds. This proved to be my downfall since my food supply seemed determined to stay out of the reach of my tentacles and even the range of my paralysis beam. Consequently I grew extremely hungry until, finally, in a berserk state I tried to eat a power station which definitely wasn't a good idea.

Each monster has its own set of abilities and restrictions and these are outlined on monster cards which are supplied with the tape and instruction book to form an attractively boxed set.

Points are awarded for buildings crushed, people eaten and tanks and

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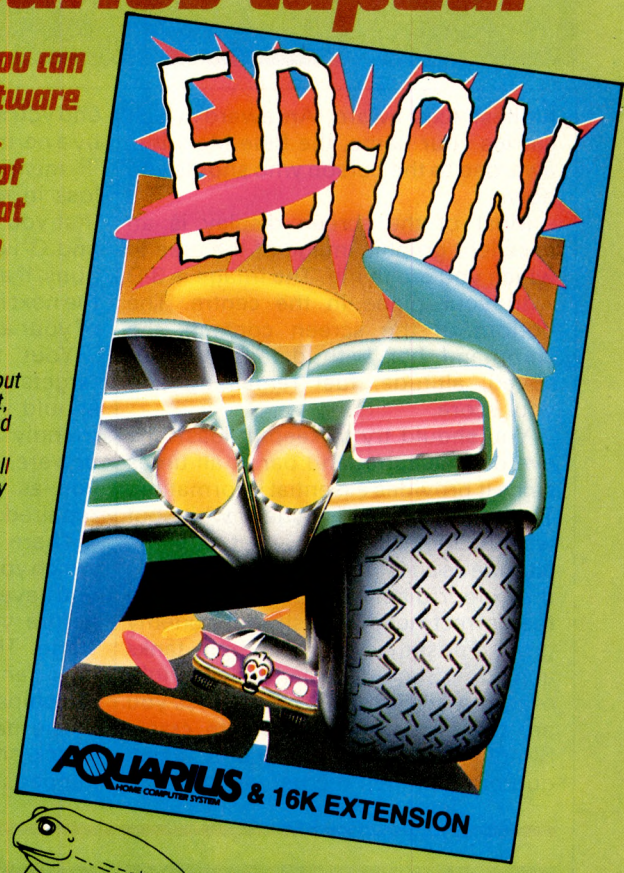
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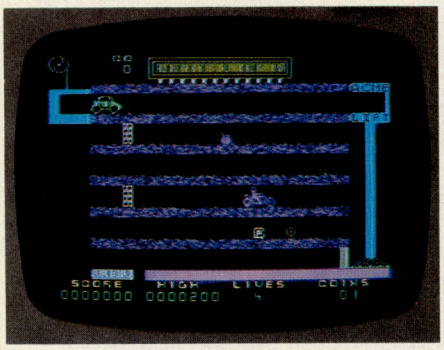
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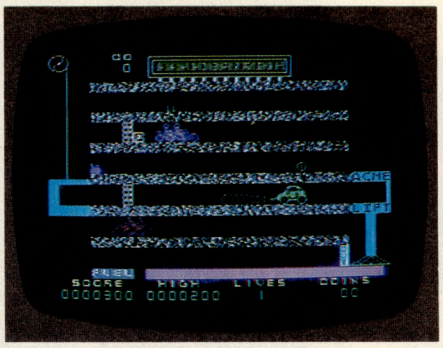
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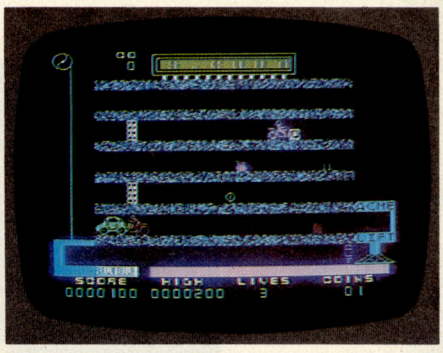
helicopters destroyed so should you have a preference for one of these activities then you can choose an option where you will get more points for your chosen field.

This highly original and enjoyable game is strongly recommended for anyone who owns an Atari, Apple or expanded VIC-20.

Presentation	**90%**
Addictive quality	**75%**
Use of graphics	**85%**
Value for money	**80%**







MORRIS MEETS THE BIKERS

Supplier: Automata
Computer: 16/48k Spectrum
Price: £6

This game represents something of a departure for Automata: the Pi-Man does not appear, there are no large prizes for successful players, and it is not an adventure. 'Morris Meets The Bikers' is, in fact, an arcade-style game with a typically eccentric Automata story line.

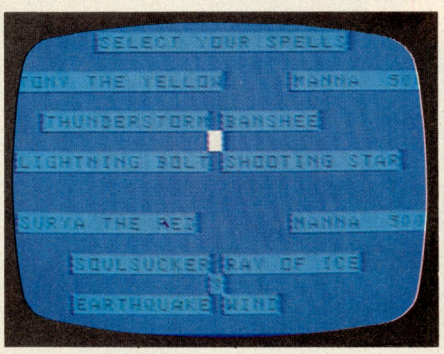
In this game the player takes the part of Morris Minor, a claustrophobic car that is trapped in a multi-storey car park on a wet Tuesday afternoon. Being claustrophobic, Morris has his mind set on the great outdoors, but for some unexplained reason sinister forces — a gang of anti-social motorbikes — are out to get him. Morris must make his way to the exit, but to pay the parking fees he must pick up 10 gold coins which are scattered about on the various levels, all the while avoiding tin tacks, wheel clamps that prevent him moving, parking signs, and of course the bikes.

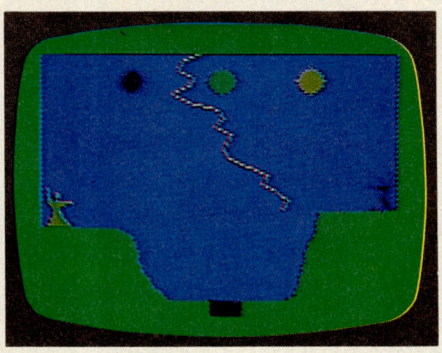
The game loads quickly, and the screen displays prompts to allow the player to choose which keys control the game (something other manufacturers would do well to emulate) or to select the Kempston joystick option.

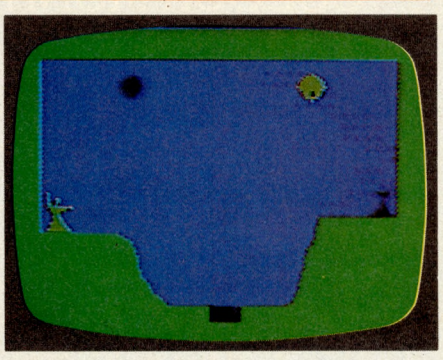
Once keys have been allocated the screen shows a cut-away profile of the various car park levels. There are two lifts which Morris must use to move between levels, and several staircases which impede the heroic car's progress. The coins are randomly placed with only one being visible at any time, and in many cases it is impossible to reach the coin without meeting one of the hazards; in this case it is simply a matter of deciding which is the least destructive. Tin tacks slow Morris down and make it more likely that a motorbike will get to him, wheel clamps stop him in his tracks for a short period, and the parking signs extract a penalty of three coins. Morris's only weapon is his horn, a blast from which will demolish the bikes. Furthermore, there are nine screens to be negotiated.

The other side of the cassette contains a sensitive — not to mention tuneless — rendition of 'Leader of the Pac', a sad and slightly smutty story of love between a girl and a Pac-Man, performed with great feeling by Lady Clair Sinclive and the Pi-Men. In fact, for masochists everywhere an album of the Pi-Man's Greatest Hits is available from Automata — an ideal present for the whole family?

Presentation	**75%**
Addictive quality	**60%**
Use of graphics	**60%**
Value for money	**70%**







WIZARD WAR

Supplier: Salamander Software
Computer: Dragon 32 & 2 joysticks
Price: £7.95

Wizard War is one of a small group of truly multi-player games available for home computers. It can apparently cope with up to nine players arranged into three teams: the red, green and yellow wizards. However, only two players can play the game at any one time.

The players of Wizard War are engaged in a series of magical duels, the purpose of which is to determine who will rule the world of Xarg.

Each duel is a contest between two wizards of equal strength or manna in a duel to the death. This manna is a measure of a wizard's strength and should it reach zero then the wizard dies and the duel is lost. Manna is also used to buy spells which are hurled at the opposing wizard but in a civilised manner (only one per round).

Each round of a duel has two stages. In the first instance the wizard selects one of the four spells he is offered — which are different for each wizard each round. There is a selection of attacking and defensive spells. The

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wizards choose their spells by a movement of their joysticks which can be hidden from the other's view. It is a satisfactory method of secret selection. As soon as both wizards have chosen their spells the combat begins and the screen display changes.

The screen changes to a scene with the two wizards standing on mountain tops, facing each other across a valley. At the base of the valley is a trap door through which a great variety of summoned creatures may appear. Overhead a selection of the three suns (red, yellow and green) shine brightly as the wizards do battle. The exchange between the wizards depends upon the spells that they have selected. If they have both chosen offensive spells then it's a race to guide your spell to your opponent, since only the first spell to make contact has affect. If both have chosen defensive spells then the round will end without incident. Similarly a wizard can elect to withhold his spell to save energy. Each spell has a cost which is deducted from its owner's manna.

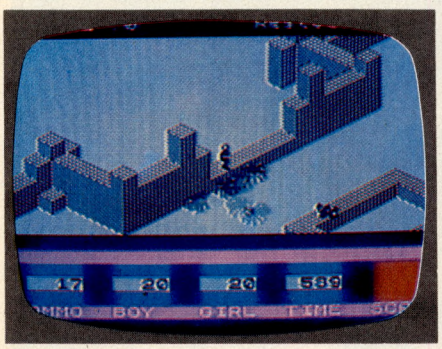
There are 24 spells described in the accompanying spell-book and each has a set duration, cost in energy, damage potential and a degree of control that must be exerted over it by the wizard. The player's control over a spell may decide the result of a duel. If the player has summoned a dragon, but then doesn't possess the joystick skill to guide it against his opponent, then the spell will have been wasted.

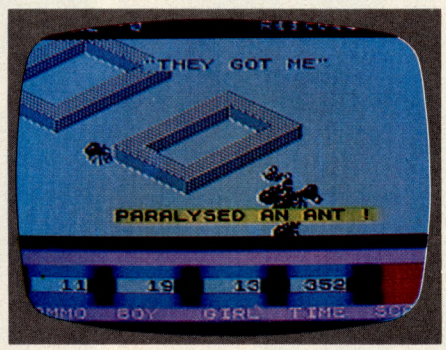
Control varies between spells and ranges from full as in the dragon, through only partial left and right control over a meteor storm, to none at all over a defensive fog. The most difficult spell to control is the banshee which must be guided to your opponent on a path which doesn't allow it to touch the ground nor drift too far above it.

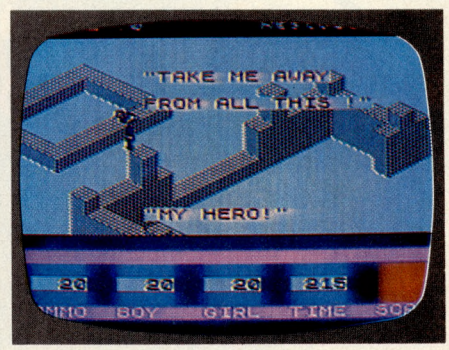
The spells are also grouped into wizard ownership. A spell designated RED will be best used by a red wizard. The suns also affect the spells and as before a red spell will be at its most powerful under a red sun. Not all of the suns shine at any one time but they follow set patterns. The red sun rises and sets every other round, whereas the green sun is in the sky for two rounds then down for two and the yellow is up for four then down for four.

The complexity added by the suns makes an already challenging game into a skilful contest of strategy and double bluff. It is a shame that this excellent game isn't available for a machine with better graphics capabilities.

Presentation	**60%**
Addictive quality	**70%**
Use of graphics	**40%**
Value for money	**80%**







ANT ATTACK

Supplier: Quicksilva
Computer: 48k Spectrum
Price: £6.95

Much has been made of Sandy White's 'Soft Solid' 3D effects in this new game from Quicksilva — and they *are* truly amazing, giving perspective and depth to the image on the TV screen. First impressions can be deceptive; initially I thought that the superb graphics were merely window-dressing for a somewhat boring game, but after a few attempts I became engrossed.

There's the usual Quicksilva verbiage to fight through before playing Ant Attack — waffling on about the City 'resting dreaming of past glories, solid and unmoving: the signatures of a long dead race. The City washed clean by the sun's rays . . .' does absolutely nothing to help the player and, because similar rubbish appears on every Quicksilva tape, it's all becoming tiresomely predictable.

Anyway, having fought a way through this excess of flannel, the first thing to do is to choose your sex — no kidding, this is a genuinely non-sexist game; the player may choose to be either male or female and will set out to rescue members of the opposite sex who are trapped behind the city's walls.

The playing area is in black, white and various shadings of grey: in fact the lack of colour adds a certain Gothic gloom to the city and is very impressive — the real reason for the absence of colour is to speed the game up, and this it does very well; response times are very good.

The city is called Antescher, presumably because it bears a strong resemblance to Escher's work; and it is extremely large, extending over several screens in size. A particularly neat touch is the provision for altering the angle at which the city is viewed: pressing one of the four keys allocated allows a different aspect to be seen. Other keys enable the male or female character to rotate, move forwards, jump, throw grenades or, as a last resort, to return to the starting position. Climbing over the various walls is done by pressing 'move' and 'jump' simultaneously.

The mechanics of the game are very simple: all you need to do is to get into the city and rescue the ants' captives, all the while avoiding or destroying the killer ants. Initially a victim will be found somewhere close to the point of entry into the city; later in the game, however, a fair bit of wandering about is necessary before one is found.

The attacking ants are really impressive and quite scary, and they have the knack of trapping the rescuer in corners from which it is difficult to escape: this is where the grenades come in handy, but ammunition is limited so these must be used sparingly.

When a captive has been spotted (with ego-gratifying remarks like 'My hero' and pleas to be 'taken away from all this'), the player then has to escort him/her back to the city gates before going in search of others — to aid in this there is a scanner to guide him/her in the right direction. And that's all there is to it — the player must keep returning until all victims have been rescued.

Presentation	**50%**
Addictive quality	**65%**
Use of graphics	**100%**
Value for money	**75%**



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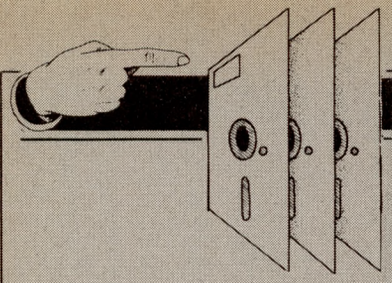
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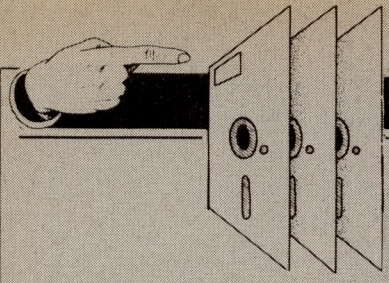
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I4	IBIS Business Information Systems	0244 317527
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CP/M	£199	T5
CP/M	£400	G4
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Apple	POR	I3
IBM	POR	H2
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CP/M	£850	S9
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Apple II	£250P	S4
Apple II	£600	T2
Apple II	£490	L4
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CP/M	£375	L1
CP/M	£400	G1
CP/M	£400	M3
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M4	Micropro International	01-499 5777
M5	M.A.P. Comp Systems	061-624-5662
M6	Mercator	0272 731079
M7	Micros For The Movement	01-387 6192
M8	MMG Consultants	06845 63555
M9	Mediatech	01-903 4372
M10	ME-TEC Computer Services	060526 620
M11	Molimerx Ltd	0424 220391
M12	Mountain Software Services	0276 72772
M13	Micro Planning Services	0272 684530
O1	Omicron Design	0784 31809
O2	Open Computer Services	0273 671666
P1	Padmede Computer Services	02514 21892
P2	Personal Computers Ltd.	01-377 1200
P3	Professional Computer Services	061 624 4065
P4	Prestige Computers	021 561 2001
P5	Precision Software	01-330 7166
R1	Rockliff	051-521 5830
S1	SMG Micro Computers	0474 55813
S2	The Softwarehouse	01-637 2108
S3	Sosoft Ltd	0202 735656
S4	Systematics International	0440 61121
S5	Sumlock Bondain	01-250 0505
S6	Stemmos	01 602 6242
S7	Software Aids Int	01-904 8139
S8	SD Micros	01 836 9520
S9	Southdata Ltd	01-994 6477
S10	Skisoft Computer Services	0273 671666
S11	Saphire Systems Ltd	01-554 0582
T1	Tridata Micros Ltd.	021 622 6085
T2	Templeman Software	0789 66237
T3	The Micro Solution	0608 3256
T4	Tip Data Ltd	0375 33910
T5	TABS Ltd	0264 64166
U1	Unique Computer Application Ltd	05827 66551
V1	Vlasak Electronics Ltd.	0494-448633
V2	Vauntberry Ltd	0329 235846
W1	Wisbech Computer Services	0945 64146
W2	Westfarthing Comp Services	03265-4098
W3	Western Computers	0253 404676
W4	Walton Microcomputer Ltd	Camberly 28366
X1	Xetal	061 678 0234
X2	Xitan Systems Ltd	0703 334711

Application/Machine	Price	Code
Analysis ledger		
Philips P2000	£100	P4
Appointments planner		
Act Sirius 1	£115	C7
Apple II	£300	A6
Challenger	£25	C7
CP/M	POR	G4
Arable recording & costing		
CP/M	£1500	C4
Architects package		
CP/M	£750	M6
Assembler dev		
PET/CBM	£50	L2
Auction package		
CP/M	£700	M6
BBC Basic		
CP/M	£95	M10
Grundy 8200	£95	M10
Bill of materials		
Apple II	£199	T5
CP/M	£850	B5
CP/M	£199	T5
CP/M	£400	G4
CP/M	£850	V2
CP/M	£390	H1
Cromemco	£850	B5
IBM	£390	H1
PET/CBM	£199	T5
Superbrain	£450	T3
8080/280	£390	H1
Bookmakers package		
CP/M	POR	B7
Bookshop stock control		
Sorcerer	£1450	L2
Budgeting package		
Apple II	£125	P2
Apple II	£125	T2
CP/M	£95	B5
Cromemco	£95	B5
North Star Horizon	£95	B5
Building estimating		
Apple II	£570	S8
CP/M	£325	C9
IBM	£325	C9
Sirius	£325	C9
Building services		
Apple	POR	H2
Apple	POR	I3
IBM	POR	H2
North Star	POR	I3
Sirius	POR	H2
Bureau de change		
PET/CBM	£8	H3

Application/Machine	Price	Code
Bursar package		
CP/M	POR	M8
Cash flow		
Apple II	£125	P2
Apple II	£80	V1
Apple II	£100	C8
CP/M	£250	L3
CP/M	£95	B5
Cromemco	£95	B5
North Star Horizon	£95	B5
PET/CBM	£195	D1
Car showroom sales		
Sorcerer	£1900	L2
Cash register		
CP/M	£300	G6
Cheque writer		
CBM/8032	£90	P3
PET/CBM	£90	P3
Company secretary		
CP/M	£650	C4
Construction cashflow		
Apple II	£75	S8
Construction expenditure		
Apple II	£250	S8
Construction financial control		
Apple II	£750	S8
Construction valuations		
Apple II	£500	S8
Container accounting Contract costing		
CP/M	£750	M5
CP/M	£2000	L3
CP/M & utilities		
Tandy Model II	£165	M1
Credit control		
Apple II	£98	P2
CP/M	POR	G4
PET/CBM	£650	B4
Customer file		
CP/M	£900	G4
Famos	£1000	M2
Dairy mangement		
CP/M	£1500+	C4
Database management retrieval		
ACT800	£225	H4
Apple II	£150	K2
Apple II	£60-140	S2
Apple II	£150	S5
Apple II	£75	P2
Apple II	£100	S4
Apple II	£100	C8
Apple II	£125	T2

Application/Machine	Price	Code
CP/M	£450	C4
CP/M	£100	G3
CP/M	£250	B3
CP/M	£295	G5
CP/M	£225-485	S9
CP/M	£155	X2
CP/M	£295	M4
Famos	£1500	M2
IBM	£295	M4
North Star Horizon	£250	B3
PET/CBM	£225	H4
PET/CBM	£50/150	C2
PET/CBM	£150	J1
PET/CBM	£150	G2
Superbrain	£300	S6
Tandy Model 1	£25-90	M1
Tandy Model 1	£60	S2
Tandy Model 1	£150	J1
Tandy Model 1	£32.50	M11
Tandy Model 111	£270	A4
8000 Series	POR	C2
Debt collection		
CP/M	£150	G4
CP/M	£450	V2
Dental laboratory		
Apple II	£280	A6
Dental records		
Apple II	£1700	A6
CP/M	£500	G6
Department store order program		
Sorcerer	£2500	L2
Double glazing costing		
North Star Horizon	£750	W1
CP/M	£1500	V2
Earth parameter collection & Qualification		
CP/M	£95	M10
Grundy 8200	£95	M10
Eire payroll system		
CP/M	£650	M5
Engineering/computer-aided design		
Apple II	£300	S10
Estate agent		
Apple II	£850	S5
Apple II	£850	K1
Apple II	£175	P2
Apple II	£130	C8
Apple II	£750	S4
PET/CBM	£30	H3
CP/M	£700	B5
CP/M	£850	S9
Simpled Triton 3	£350	B3
MZ-80K	£195	W1
Superbrain	£600	S6
Superbrain	£600	C3
Equipment lease/rent/HP		
CP/M	£400	G1

Application/Machine	Price	Code
Expense analysis		
Philips P2000	£150	P4
Farm accounts		
CP/M	£750	C4
Financial & arable management		
CP/M	£2200	C4
File handling		
PET/CBM	£225	H4
PET/CBM	£645	D1
Financial modelling		
Act Sirius 1	£595	A1
Apple II	£450	P2
Apple II	£360	C8
CP/M	£400	G1
CP/M	£95	B5
CP/M	£425-535	A1
CP/M	£400	S11
CP/M	£400	V2
Cromemco	£95	B5
North Star Horizon	£95	B5
PET/CBM	£425-535	A1
PET/CBM	£250	D1
RAIR Black Box	POR	A3
Financial planning		
Act Sirius 1	£150	A1
Apple II	£250	S4
CP/M	£245	G4
CP/M	£90	X2
UCSD-P	£350	S4
Flare system design		
		S10
Fluid flow		
		S10
General ledger/NL		
Apple II	£300	S5
Apple II	£300	K2
Apple II	£455	P2
Apple II	£225	V1
Apple II	£295	C6
Apple II	£250P	S4
Apple II	£600	T2
Apple II	£490	L4
Apple II	£199	T5
CBN/8032	£350	W3
CP/M	£500	L3
CP/M	£375	L1
CP/M	£400	G1
CP/M	£400	M3
CP/M	£400	B5
CP/M	£275	S6
CP/M	£390	S7
CP/M	£250	B3
CP/M	£300	W1
CP/M	£425	S11
CP/M	£500	G6
CP/M	£400	M5
CP/M	£1000	B1
CP/M	£199	T5

PROOF

PACKAGES

Application/Machine	Price	Code
CP/M	£950/1250	V2
CP/M	£400	M9
Cromemco	£400	B5
North Star Horizon	£250	B3
North Star Horizon PCC 2000	£400	M3
North Star Horion	£400	B5
PET/CBM	£200	C2
PET/CBM	£200	H3
PET/CBM	£199	T5
Philips P2000	£100	P4
Sharp PC3201	£450	P2
Superbrain	£400	M3
Superbrain	£400	S6
Tandy Model I	£90	M1
Tandy Model II	£200	M1
Tandy Model I	£225	M11
Tandy Model I	£225/325	T1
Tandy Model II	£425	T1
UCSD-P	£350	S4
Vector	£400	C5
8080/Z80	£357	L1
8080/Z80	£275	G3
General purchase transaction proc.		
CBM/8032	£495	S3
Greyhound race program		
Apple II	£750	M6
Health authority PPM		
Sorcerer	£2500	L2
Housing association package		
PET/CBM	POR	M7
Hotel billing		
Philips P2000	£500	P4
Hotel management		
CP/M	£750	H5
North Star Horizon	750	H5
RAIR Black Box	POR	A3
Incomplete records		
Act Sirius I	£1200	S1
Apple II	£250	S2
Apple II	POR	K1
Apple II	£425	P2
Apple II	£490	L4
CBM/8032	£150	W3
CP/M	£750	M3
CP/M	£250	B5
CP/M	£975	B3
CP/M	£750	W1
CP/M	£915	M5
CP/M	£155	C10
CP/M	£400	G4
Cromemco	£250	B5
North Star Horizon	£750	M3
North Star Horizon	£250	B5
North Star Horizon	£975	B3
Philips P2000	£150	P4
Superbrain	£750	M3
Superbrain	£1200	S1
Tandy Model I	£25-50	M1
Tandy Model I	£40	M11
Industrial cleaning package		
CP/M	£1000	B1
Industry Factory loading		
CP/M	£1000	X1
Industry work study		
DM5	£1000	X1
Inn Management		
Act Sirius I	£185	C7
Instrument logging		
Sorcerer	£500	L2
Insurance broker		
Act Sirius I	£450	C7
CP/M	POR	G4
Insurance renewals		
CBM/8032	£1200	S3
Integrated accts		
Act Sirius I	£795	O1
Apple II	£300	P2
Apple II	£855	V1
Apple II	£1500	T2
Apple II	£1470	L4
Apple II	£300	W2
Apple II	£199	T5
CBM/8032	£1500	P3
CP/M	£950	L1
CP/M	£750	C4
CP/M	£1100	G1
CP/M	£990	M3
CP/M	£690	B5
CP/M	£900	B5
CP/M	£950	B3
CP/M	£1200	S11
CP/M	£199	T5
CP/M	£3400	M9
Cromemco	£690	B5
Cromemco	£900	B5
Famos	£2000	M2
MZ-80K	£150	P2
North Star Horizon	£950	B3
North Star Horizon	£690	B5
North Star Horizon	£900	B5
PET/CBM	£800	S3
PET/CBM	£199	T5
North Star Horizon	£990	M3
PET/CBM	(£50)	C2
PET/CBM	£650	J1
PET/CBM	£650	G2
Philips P2000	£650	P4
Sirius	£1250	I4
Superbrain	£990	M3
Superbrain	£1200	S6
Superbrain	£1000	T3
Superbrain	£1200	S1
Tandy Model I	£300	M1
Tandy Model II	£600	M1
Tandy Model I	£75	J1
Tandy Model II	£795	O1
Tandy Model III	£550	A4
Vector	£1000	C5
Vector	£1250	I4
8000 Series	POR	C2
8080/Z80	£950	L1
8080/Z80	£995	G3
Investment portfolio		
Tandy Model I	£20	S2
Invoicing		
Act Sirius I	£95	C7
Act Sirius I	£265	O1
Act Sirius I	£195	A1
Apple II	£295	S2
Apple II	£300	P2
Apple II	£140	V1
Apple II	£1000	T2
Apple II	£199	T5
Challenger	£25	C7
CP/M	£325	L1
CP/M	£250	M3
CP/M	£250	S7
CP/M	£100	B5
CP/M	£100	B3
CP/M	£300	W1
CP/M	£300	B1
CP/M	£199	T5
CP/M	£400	G4
CP/M	POR	W4
CP/M	£400	M9
CP/M	£249	P1
CP/M	£280	U1
CP/M	£390	H1
Cromemco	£100	B5
IBM	£390	H1
North Star Horizon	£100	B3
North Star Horizon	£250	M3
North Star Horizon	£100	B5
PET/CBM	£350	A1
PET/CBM	POR	J1
PET/CBM	£199	T5
Philips P2000	£150	P4
Sorcerer	£290	L2
Superbrain	£250	M3
Superbrain	£150	S6
Tandy Model I	£90	M1
Tandy Model II	£200	M1
Tandy Model I	£25	M11
Tandy Model I	£75	T1
Tandy Model II	£125	T1
Tandy Model II	£265	O1
Tandy Model III	£280	A4
UCSD-p	£350	S4
8080/Z80	£325	L1
8080/Z80	£390	H1
Jewellers System		
CP/M	£1000	S7
CP/M	POR	G4
Job costing		
Act Sirius I	£350	C7
Act Sirius I	£265	O1
Apple II	£990	X1
Apple II	£199	T5
CBM/8032	£350	W3
CP/M	£350	M3
CP/M	£990	X1
CP/M	£395	G6
CP/M	£450	M5
CP/M	£300	B1
CP/M	£199	T5
BOS	£1500	T4
CP/M	£1500	V2
CP/M	£1000	X1
CP/M	£600	A2
CP/M	£495	C9
IBM	£495	C9
North Star Horizon	£350	M3
PET/CBM	£199	T5
Philips P2000	£400	P4
Sirius	£495	C9
Superbrain	£350	M3
Tandy Model II	£265	O1
UCSD-p	£350	S4
Job order control		
8080/Z80	£275	G3
Legal precedents		
CP/M	£1150	C4
Leisure		
Apple II	£550	W5
Letter writer		
Apple II	£80	V1
Apple II	£99	T5
CP/M	£150	M3
CP/M	£99	T5
CP/M	POR	G4
North Star Horizon	£150	M3
Superbrain	£150	M3
Local government housing maint		
RAIR Black Box		
POR	A3	
Magazine subscriber		
CP/M	£950	S9
Mailing List		
Apple II	£50-150	S2
Apple II	£300	S5
Apple II	£300	K1
Apple II	£40	P2
Apple II	£100	S4
CP/M	£450	C4
CP/M	£250	G1
CP/M	£75	S9
CP/M	POR	G4
CP/M	£250	U1
CP/M	£149	M4
IBM	£149	M4
North Star Horizon	£195	W1
PET/CBM	£15	A1
PET/CBM	£35	H3
Sorcerer	£290	L2
Tandy Model I	£40	M1
Tandy Model II	£62-50	M1
Tandy Model I	£50-150	S2
Tandy Model I	£25/38/55	H1
Mail shot		
Act Sirius I	£95	A1
Apple II	£14	S2
Apple II	£40	P2
Apple II	£25	T2
Apple II	£99	T5
CBM/8032	£350	W3
Challenger	£25	C7
CP/M	£450	C4
CP/M	£90	M3
CP/M	£100	S7
CP/M	£50/150	G5
CP/M	£99	T5
MCZ Zilog	£250	I1
North Star Horizon	£90	M3
Superbrain	£90	M3
Tandy Model I	£75+	G4
Tandy Model II	£75+	G4
Tandy Model III	£160	A4
Membership accting		
Apple II	£75	P2
CP/M	POR	G4
MCZ Zilog	£250	I1
Motor Dealer		
Act Sirius I	£345	C7
CBM/8032	£950+	P3
CP/M	POR	G4
Famos	£5000	M2
NEDO price adjustment		
Apple II	£200	S8
Nominal ledger Order entry/invoicing		
CP/M-86	£500	O2
Apple II	£99	T5
CBM/8023	£750	P3
CP/M	£350	G1
CP/M	£395	G6
CP/M	£300	M5
CP/M	£550	L1
CP/M	POR	B1
CP/M	£99	T5
CP/M	£400	M9
CP/M	£249	P1
IBM	£395	B2
8080/Z80	£550	L1
Order Processing		
AppleII	£99	T5
CP/M	£99	T5
CP/M	£500	G4
CP/M	£400	M9
Philips P2000	£200	P4
Sirius	£400	I4
Vector	£400	I4
Office admin		
Apple II	£100	S4
Pad to plotter systems		
Apple II	£250	P2
Apple II	£180	C8
Payroll		
Act Sirius I	£300+	O1
Act Sirius I	£195	A1
Apple II	£200	S2
Apple II	POR	S5
Apple II	POR	K1
Apple II	£200	P2
Apple II	£375	V1
Apple II	£375	C6
Apple II	£250P	S4
Apple II	£490	L4
Apple II	£199	T5
CBM/8032	£375	P3
CBM/8032	£350	W3
Challenger	£24	C7
CP/M	£450	L3
CP/M	£475	L1
CP/M	£450	C4
CP/M	£500	G1
CP/M	£390	M3
CP/M	£500	B5
CP/M	£350	B3
CP/M	£425	G11
CP/M	Lease	W1
CP/M	£495	G6
CP/M	£450	M5
CP/M	£300	B1
CP/M	£199	T5
CP/M	£395	G4
CP/M	POR	W4
CP/M	£600	M9
CP/M	£325	M12
CP/M-86	£500	O2
Famos	£1500	M2
North Star Horizon	£350	B3
North Star Horizon	£390	M3
North Star Horizon	Lease	W1
PET/CBM	£200/350	C5
PET/CBM	£400	I2
PET/CBM	£150	G2
PET/CBM	£150	J1
PET/CBM	£150	C2
PET/CBM	£10	H3
PET/CBM	£199	T5
Philips P2000	£300	P4
Scorcerer	£250	L2
Sirius	£600	I4
Superbrain	£390	M3
Superbrain	£400	S6
Superbrain	£250+	T3
Tandy Model I	£200	M11
Tandy Model I	£218	T1
Tandy Model II	£375	T1
Tandy Model II	£300+	O1
UCSD-p	£350	S4
8000 Series	£250	C2
8080/Z80	£475	L1
8080/Z80	£275	G3
PET/CBM	£150	G2
PET/CBM	£150	J1
PET/CBM	£150	C2
Sorcerer	£250	L2
Tandy Model I	£249	M1
TRS-80	£200	M11
TRS-80I	£218	K1
TRS-80I	£218	T1
TRS-80II	£375	T1
8000 Series	£250	C2
8080/Z80	£475	L1
8080/Z80	£275	G3
Victor	£600	I4
Perpetual Inventory		
CP/M	£150	B5
Cromemco	£150	B5
Personnel records		
Apple II	£98	P2
CP/M	£450	C4
MCZ Zilog	£400	I1
Petaid report generator		
PET/CBM	£250	S3
Petsoft programs		
PET/CBM	£160	J1
Pig management		
CP/M	£1250	C4
Pipeline pressure drops		
Apple II		S10
Pipeline sizing		
Apple II		S10
Point of sale		
CP/M	£400	M9
Postal advertising response packages		
Apple II	£350	S2
Price lister		
PET/CBM	£12	H3
Product Management		
Act Sirius I	£245	C7
Production analysis		
Apple II	£75	P2
Production control		
CBM/8032	£650+	P3
CP/M	£2400	V2
PET/CBM	£650+	P3
Prof appts groups		
8080/Z80	£275	G3
Prof appts individ		
8080/Z80	£220	G3

PACKAGES

Application/Machine	Price	Code
Prof client billing		
8080/Z80	£330	G3
Programming aids		
Apple II	£40	P2
Project mangagement		
Apple	£695	M13
CBM/8032	990	C11
IBM	1100	M13
IBM	1600	C11
Sirius	990	M13
Sirius	1600	C11
Victor	£990	M13
Property management		
CP/M	£750--15000	C4
CP/M	£400	M3
CP/M	£1000	B1
North Star Horizon	£400	M3
Superbrain	£400	M3
UCSD-p	£175	S4
Publishers System		
CP/M	£1850	S7
Purchase ledger		
Act Sirius I	£395	A1
Apple II	£300	S5
Apple II	£300	K1
Apple II	£295	C6
Apple II	£300	P2
Apple II	£315	V1
Apple II	£250P	S4
Apple II	£300	T2
Apple II	£490	L4
Apple II	£199	T5
Challenger	£25	C7
CBM/8032	£350	W3
CP/M	£450	G1
CP/M	£500	L3
CP/M	£425	L1
CP/M	£400	M3
CP/M	£400	B5
CP/M	£395	S7
CP/M	250	B3
CP/M	£300	W1
CP/M	£425	S11
CP/M	£495	G6
CP/M	£200	M5
CP/M	£300	B1
CP/M	£199	T5
CP/M	£950--1250	V2
CP/M	POR	W4
CP/M	£400	M9
CP/M	£400	G4
CP/M	£450	U1
CP/M	£495	X2
CP/M-86	£500	O2
Cromemco	£400	B5
North Star Horizon	£250	B3
North Star Horizon	£400	M3
North Star Horizon	£400	B5
Sorcerer	£490	L2
Sirius	£325	I4
Superbrain	£400	M3
Superbrain	£300	S6
PET/CBM	£300	B4
PET/CBM	£200	C2
PET/CBM	POR	J1
PET/CBM	£350	H3
PET/CBM	£199	T5
Philips P2000	£200	P4
Sharp PC3201	£300	P2
Tandy Model I	£90	M1
Tandy Model II	£200	M1
Tandy Model I	£225	M11
Tandy Model I	£225	T1
Tandy Model II	£375	T1
UCSD-p	£350	S4
Vector	£400	C5
Victor	£325	I4
8000 Series	£250	C2
8080/Z80	£275	G3
8080/Z80	£425	L1
Quotation estimating		
Act Sirius I	£125	C7
CP/M	POR	G4
Philips P2000	£400	P4
Recruitment Agency		
Act Sirius I	£345	C7
Reinforcement bar schedule		
Apple II	£150	S8
Relief valve sizing		
Apple II		S10
Renewals ledger		
Philip P2000	£200	P4
Report generator		
CP/M	POR	G4
Requirements planning		
CP/M	£700	V2
Resource optimiser		
Apple II	£295	C10

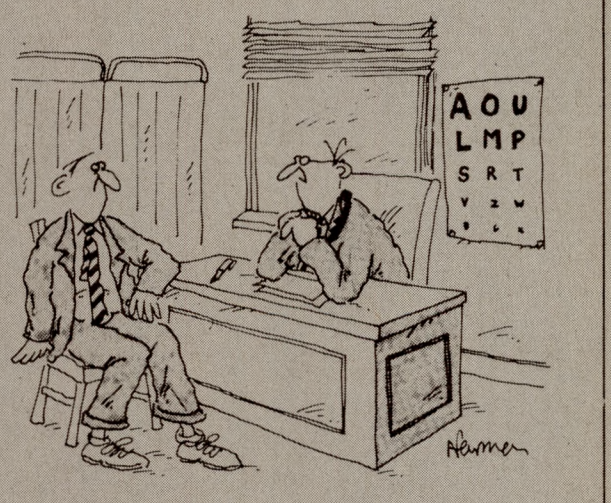
Application/Machine	Price	Code
Sales ledger		
Act Sirius I	£395	A1
Apple II	£300	S5
Apple II	£300	K1
Apple II	£295	C6
Apple II	£300	P2
Apple II	£315	V1
Apple II	£250P	S4
Apple II	£600	T2
Apple II	£490	L4
Apple II	£199	T5
CBM/8032	£350	W3
Challenger	£25	C7
CP/M	£450	G1
CP/M	£500	L3
CP/M	£425	L1
CP/M	£400	M3
CP/M	£400	B5
CP/M	£365	S7
CP/M	£350	B3
CP/M	£300	W1
CP/M	£425	S11
CP/M	£495	T4
CP/M	£200	M5
CP/M	£300	B1
CP/M	£199	T5
CP/M	£400	G4
CP/M	£950--1250	V2
CP/M	POR	W4
CP/M	£400	M9
CP/M	£249	P1
CP/M	£390	H1
CP/M-86	£500	O2
Cromemco	£400	B5
IBM	£390	H1
North Star Horizon	£250	B3
North Star Horizon	£400	M3
North Star Horizon	£400	B5
PET/CBM	£300	B4
PET/CBM	£800	C1
PET/CBM	POR	J1
PET/CBM	£200	C2
PET/CBM	£350	C7
PET/CBM	£199	T5
Philips P2000	£200	P4
Sharp PC 3201	£300	P2
Sorcerer	£490	L2
Superbrain	£400	M3
Superbrain	£300	S6
Superbrain	£199	T5
Tandy Model I	£90	M1
Tandy Model II	£90	M1
Tandy Model I	£225	M11
Tandy Model I	£225	T1
Tandy Model II	£375	T1
UCSD-p	£350	S4
Vector	£400	C5
8000 Series	£250	C2
8080/Z80	£275	G3
8080/Z80	£425	L1
8080/Z80	£390	H1
Typing tutor		
CP/M	£50-125	A5
Utilities		
Apple II	£40	P2
Apple II	£20	C6
CP/M	£50	B5
ITT 2020	£20	C6
Utility set		
PET/CBM	£78	H3
Various engineering		
Tektronix		E1
Various thermal insulation industry systems		
BOS	£2000+	T4
Hewlett Packard		E1
VAT master		
PET/CBM	£25	H3
VAT register		
Tandy Model I	£15	M11
Video hire system		
Act Sirius I	£125	C7
CP/M	£499	G4
CP/M	£795	L5
Tandy Model III	£460	A4
Video message		
Apple	£200	G3
Warehousing		
CBM/8032	POR	S1
CBM/8032	£375	P3
Word processing		
ACT 800	£375	H4
Act Sirius I	£295-325	A1
Act Sirius I	£295+	O1
Apple II	£60	S2
Apple II	£75	K1
Apple II	£75	S5
Apple II	£150-300	P2
Apple II	£75	J1
Apple II	£120	V1
Apple II	£180/95	S4
Apple II	£30	C8
Apple II	£500	T2

Application/Machine	Price	Code
Apple II	£99	T5
CP/M	£260	C4
CP/M	£400	G1
CP/M	£250	M3
CP/M	£250	S11
CP/M	£1000	B1
CP/M	£99	T5
CP/M	£420	V2
CP/M	£295	X2
CP/M	£350	M12
CP/M	£295	M4
Famos	£500	M2
IBM	£295	M14
IBM	£375	B2
North Star Horizon	£250	M3
PET/CBM	£375	H4
PET/CBM	£325	C5
PET/CBM	£75/150	C2
PET/CBM	£75/150	J1
PET/CBM	£75/150	G2
PET/CBM	£35	H3
PET/CBM	£249	P5
Philips P2000	£230	P4
Superbrain	£250	M3
Tandy Model I	£50/75	M1
Tandy Model II	£74-50	M1
Tandy Model I	£200	S2
Tandy Model I	£45/95	J1
Tandy Model I	£15	H1
Tandy Model II	£295+	O1
Vector	£400	C5
8000 Series	£250	C2
Work In Progress		
CP/M	£850	B5

MACHINES

Application/Machine	Price	Code
ACT 800		
Database management/	£225	H4
Word processing	£375	H4
Act Sirius 1		
Appointments planner	£115	C7
Building est	£325	C3
Building services	POR	H2
Financial modelling	£595	A1
Financial planning	£150	A1
Incomplete records	£1200	S1
Inn Management	£185	C7
Insurance Broker	£450	C7
Integrated Accts	£495	A1
Integrated Accts	£795	O1
Integrated Accts	£1250	I4
Invoicing	£95	C7
Invoicing	£265	O1
Invoicing	£195	A1
Job Costing	£350	C7
Job Costing	£265	O1
Job Costing	£495	C9
Mailing list	£95	A1
Motor Dealer	£345	C7
Order processing	£400	I4
Payroll	£300+	O1
Payroll	£195	A1
Payroll	£600	I4
Project Management	£245	C7
Project Management	£900	M13
Project Management	£1600	C11
Purchase ledger	£395	A1

Application/Machine	Price	Code
Purchase ledger	£325	I4
Quotation Estimating	£125	C7
Recruitment agency	£345	C7
Sales Ledger	£395	A1
Solicitors package	£1400	S1
Stock control/recording	£265	O1
Stock control/recording	£195	A1
Stock control/recording	£495	C9
Time/cost recording	£800	S1
Video hire system	£125	C7
Word processing	£295/325	A1
Word processing	£295+	O1
Apple II		
Appointments planner	£300	A6
Bill of materials	£199	T5
Budgeting	£125	T2
Building estimating	£570	S8
Building services	POR	H2
Building services	POR	I3
Cash flow	£80	V1
Cash flow	£75	P2
Cash flow	£100	C8
Construction cashflow	£75	S8
Construction expenditure	£250	S8
Construction financial control	£750	S8
Construction valuations	£500	S8
Database management/ information retrieval	£150	K1
Database management/ information retrieval	£60-140	S2
Database management/ information retrieval	£150	S5
Database management/ information retrieval	£98	P2
Database management/ information retrieval	£100	S4
Database management	£75	P2
Database management	£100	C8
Database management	£125	T2
Dental laboratory	£280	A6
Dental records	£1700	A6
Engineering/computer-aided design	£300	S10
Estate agent	£850	S5
Estate agent	£850	K1
Estate agent	£750	S4
Estate agent	£130	C8
Financial modelling	£360	C8
Financial planning	£250	S4
Flare system design		S10
Fluid flow		S10
General ledger/NL	£300	K1
General ledger/N/L	£450	P2
General ledger/NL	£300	S5
General ledger/NL	£225	V1
General ledger/NL	£295	C6
General ledger/NL	£250P	S4
General ledger/NL	£600	T2
General ledger/NL	£490	L4
General ledger/NL	£199	T5
Greyhound race program	£750	M6
Incomplete records	POR	K1
Incomplete records	£250	S2
Incomplete records	£450	P2
Incomplete records	£490	L4
Integrated accts	£885	V1
Integrated accts	£300	P2
Integrated accts	£1500	T2
Integrated accts	£300	W2



'Dyslexia need not necessarily mean the end of your career, Mr Thomas—for example, have you ever considered writing microcomputer manuals?'

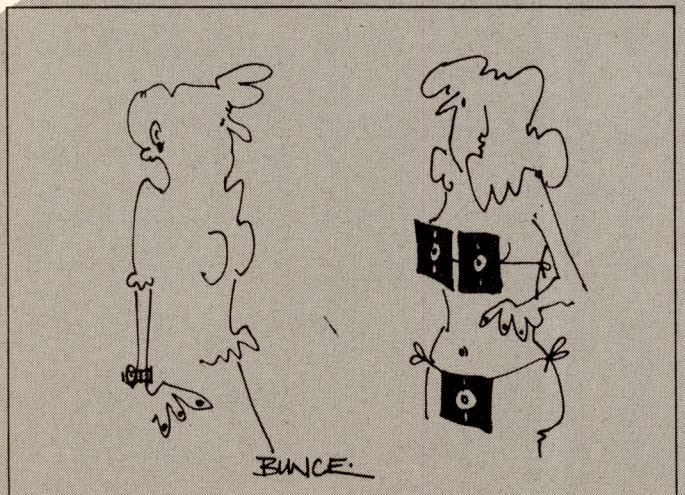
PACKAGES

Application/Machine	Price	Code
Integrated accts	£1470	L4
Integrated accts	£199	T5
Invoicing	£295	S2
Invoicing	£300	P2
Invoicing	£140	V1
Invoicing	£300	P1
Invoicing	£1000	T2
Invoicing	£199	T5
Job costing	£450	S2
Job costing	£990	X1
Job costing	£199	T5
Leisure	£550	W5
Letter writer	£99	T5
Mailing list	£300	K1
Mailing list	£40	P2
Mailing list	£50-150	S2
Mailing list	£300	S5
Mailing list	£100	S4
Mailing List	£25	T2
Mail shot	£14	S2
Mail shot	£225	P2
Mail shot	£99	T5
NEDO price adjustment	£200	S8
Order entry/invoicing	£99	T5
Order Processing	£99	T5
Pad to plotter system	£250	P2
Pad to plotter system	£180	C8
Payroll	POR	S5
Payroll	POR	K1
Payroll	£200	S2
Payroll	£375	V1
Payroll	£200	P2
Payroll	£375	C6
Payroll	£250P	S4
Payroll	£400	T2
Payroll	£490	L4
Payroll	£199	T5
Personal records	£75	P2
Pipeline pressure drops		S10
Pipeline sizing		S10
Postal advertising response package	£350	S2
Production analysis	£75	P2
Programming aids	£40	P2
Project Management	£695	M13
Purchase ledger	£300	K1
Purchase ledger	£300	P2
Purchase ledger	£300	S5
Purchase ledger	£315	V1
Purchase ledger	£295	C6
Purchase ledger	£250P	S4
Purchase ledger	£300	T2
Purchase ledger	£490	L4
Purchase ledger	£199	T5
Reinforcement bar schedule	£150	S8
Relief valve sizing		S10
Resource optimiser	£295	C10
Sales ledger	£300	K1
Sales ledger	£300	S5
Sales ledger	£300	P2
Sales ledger	£315	V1
Sales ledger	£295	C6
Sales ledger	£250P	S4
Sales ledger	£600	T2
Sales ledger	£490	L4
Sales ledger	£199	T5
SL, PL stock control	£1000	T2
Solicitor's complete record accounting	£3000	S2
Statistics	£150	G3
Statistics	£100/195	P2
Statistics	£100-195	P2
Statistics	£140	C8
Stock control/recording	£150	G3
Stock control/recording	POR	K1
Stock control/recording	£300	P2
Stock control/recording	£80	S2
Stock control/recording	POR	S5
Stock control/recording	£285	V1
Stock control/recording	£500	S4
Stock control/recording	£490	L4
Stock control/recording	£199	T5
Storage tank costing/volumes		S10
Text file librarian	£125	S4
Time/cost recording	£450	S2
Utilities	£20	C6
Video message	£200	G3
Word processing	£75	K1
Word processing	£60	S2
Word processing	£300	P2
Word processing	£75	S5
Word processing	£120	V1
Word processing	£75	J1
Word processing	£180/95	S4
Word processing	£30	C8
Word processing	£500	T2
Word processing	£99	T5
BBC		
Bill of materials	£95	M10
CBM/8032		
Cheque writer	£90	P3
General ledger/NL	£350	W3
General purpose transaction proc.	£495	S3
Incomplete records	£150	W3
Insurance renewals	£1200	S3
Integrated accts	£1500	P3
Job costing	£350	W3
Mailing list	£350	W3
Motor trader	£950+	P3
Order entry/invoicing	£750	P3
Payroll	£375	P3
Payroll	£350	W3
Production control	£650+	P3
Project Management	£990+	C11
Purchase ledger	£350	W3
Sales ledger	£500	C11
Sales ledger	£350	W3
Solicitors package	£140	S1
Stock control/recording	£175	P3
Stock control/recording	£250	C11
Stock control/recording	£350	W3
Time/cost recording	£800	S1
Warehousing	£375	P3
Challenger		
Appointment Planner	£25	C7
Invoicing	£25	C7
Mail Shot	£25	C7
Payroll	£25	C7
Purchase Ledger	£25	C7
Sales Ledger	£25	C7
Stock Control	£25	C7
CP/M		
Appointments planner	POR	G4
Arable recording & costing	£1500	C4
Architects package	£750	M6
Auction package	£700	M6
Bill of materials	£500	B5
Bill of materials	£199	T5
Bill of materials	£400	G4
Bill of materials	£850	V2
Bill of materials	£95	M10
Bill of materials	£390	H1
Bookmakers package	£1000	B1
Budgeting package	£95	B5
Builders est	£325	C9
Bursar Package	POR	M8
Cash flow	£250	L3
Cash flow	£95	B5
Cash register	£300	G6
Company secretary	£650	C4
Container accounting	£1250	M5
Contract costing	£2000	L3
Credit control	POR	G4
Customer file	£900	G4
Dairy management	£1500+	C4
Database	£350	B3
Database management/information retrieval	£450	C4
Database management/information retrieval	£100	G3
Database management/information retrieval	£400	C3
Database management/information retrieval	£600	G5
Database management/information retrieval	£225-485	S9
Database management/information retrieval	£450	V2
Database management/information retrieval	£155	X2
Database management/information retrieval	£295	M4
Debt collection	£550	G4
Dental records	£500	G6
Double glazing costing	£1500	V2
Earth parameter collection & quantification	£95	M10
Eire payroll system	£450	M5
Equipment lease/rent/HP	£400	G1
Estate agent	£700	B5
Estate agent	£850	S9
Farm accounts	£750	C4
Financial & arable management	£220	
Financial modelling	£400	G1
Financial modelling	£95	B5
Financial modelling	£400	S11
Financial modelling	£400	V2
Financial planning	£245	G4
Financial planning	£90	X2
General ledger/NL	£500	L3
General ledger/NL	£400	G1
General ledger/NL	£375	L1
General ledger/NL	£200	B5
General ledger/NL	£275	S7
General ledger/NL	£400	M3
General ledger/NL	£350	B3
General ledger/NL	£300	W1
General ledger/NL	£425	S11
General ledger/NL	£395	G6
General ledger/NL	£300	M5
General ledger/NL	£1000	B1
General ledger/NL	£199	T5
General ledger/NL	£400	M9
General ledger/NL	£950--1250	V2
Hotel management	£525	M4
Hotel management	£750	H5
Incomplete Records	£250	B5
Incomplete Records	£750	M3
Incomplete Records	£975	B3
Incomplete Records	£750	W1
Incomplete Records	£995	M5
Incomplete Records	£155	C10
Incomplete Records	£400	G4
Industrial cleaner package	£1000	B1
Industry factory loading	£1000	X1
Industry work study	£990	X1
Insurance brokers	£995	W1
Insurance broker	POR	G4
Integrated accts	£750	C4
Integrated accts	£1100	G1
Integrated accts	£950	L1
Integrated accts	£690	B5
Integrated accts	£850	S7
Integrated accts	£990	M3
Integrated accts	£900	B5
Integrated accts	£1450	B3
Integrated accts	£1200	S11
Integrated accts	£199	T5
Integrated accts	£3400	M9
Invoicing	£325	L1
Invoicing	£150	S7
Invoicing	£250	M3
Invoicing	£100	B5
Invoicing	£200	B3
Invoicing	£300	W1
Inovicing	£300	B1
Invoicing	£199	T5
Invoicing	£400	M9
Invoicing	POR	W4
Invoicing	£400	G4
Jewellers System	£1000	S7
Jewellers System	POR	G4
Job costing	£990	X1
Job costing	£350	M3
Job costing	£395	T4
Job costing	£450	M5
Job costing	£300	B1
Job costing	£199	T5
Job costing	£1500	T5
Job costing	£1500	V2
Job costing	£600	A2
Job costing	£495	C13
Legal precedents	£1150	C4
Letter writer	£150	M3
Letter writer	£99	T5
Letter writer	POR	G4
Magazine subscriptions	£950	S9
Mailing list	£450	C4
Mailing list	£250	G1
Mailing list	£75	S7
Mailing list	£75	S9
Mailing list	POR	G4
Mailing list	£250	U1
Mailing list	£149	M4
Mail shot	£450	G4
Mail shot	£90	M3
Mail shot	£50/150	G5
Mail shot	£99	T5
Membership accounting	POR	G4
Motor dealer	POR	G4
Nominal ledger	£295	P1
Order entry/invoicing	£350	G1
Order entry/invoicing	£500	T4
Order entry/invoicing	£550	M5
Order entry/invoicing	£1000	B1
Order entry/invoicing	£99	T5
Order entry/invoicing	£400	M9
Order processing	£550	L1
Order processing	£99	T5
Order processing	£400	M9
Order processing	£500	G4
Payroll	£450	L3
Payroll	£450	C4
Payroll	£500	G1
Payroll	£475	L1
Payroll	£500	B5
Payroll	£390	M3
Payroll	£450	B3
Payroll	Lease	W1
Payroll	£425	S11
Payroll	£500	G6
Payroll	£450	M5
Payroll	£300	B1
Payroll	£199	T5
Payroll	£600	M9
Payroll	POR	W4
Payroll	£395	G4
Payroll	£325	M12
Perpetual Inventory	£150	B5
Personnel records	£450	C4
Pig management	£1250	C4
Point of sale	£400	M9
Production control	£2400	V2
Property management	£750-1250	C4
Property management	£400	M3
Property management	£1000	B1
Publishers system	£1850	S7
Purchase ledger	£500	L3
Purchase ledger	£450	G1
Purchase ledger	£425	L1
Purchase ledger	£200	B5
Purchase ledger	£275	S7
Purchase ledger	£400	M3
Purchase ledger	£350	B3
Purchase ledger	£300	W1
Purchase ledger	£425	S11
Purchase ledger	£500	G6
Purchase ledger	£200	M5
Purchase ledger	£300	B1
Purchase ledger	£400	M9
Purchase ledger	POR	W4
Purchase ledger	£400	G4
Purchase ledger	£950-1250	V2
Purchase ledger	£450	U1
Purchase ledger	£495	X2
Quotation estimating	POR	G4
Report generator	POR	G4
Requirements planning	£700	V2
Sales ledger	£500	L3
Sales ledger	£450	G1
Sales ledger	£425	L1
Sales ledger	£200	B5
Sales ledger	£275	S7
Sales ledger	£400	M3
Sales ledger	£350	B3
Sales ledger	£300	W1
Sales ledger	£425	S11
Sales ledger	£500	G6
Sales ledger	£200	M5
Sales ledger	£300	B1
Sales ledger	£199	T5
Sales ledger	£400	M9
Sales ledger	POR	W4
Sales ledger	£400	G4
Sales ledger	£950-1250	V2
Sales ledger	£249	P1
Sales ledger	£390	H1
Solicitors	£995	M5
Solicitors package	£2000	M12
S/L, P/L + stock control	£1000	L3
S/L, P/L + stock control	£900	B5
S/L, P/L + stock control	£1200	M9
S/L, P/L + stock control	£500	G4
Stock control/recording	£325	L1
Stock control/recording	£750-1500	C4
Stock control/recording	£350	G1
Stock control/recording	£500	B5
Stock control/recording	£900	M3
Stock control/recording	£300	B1
Stock control/recording	£500	G4
Stock control	£550	B3
Stock control	£300	W1
Stock control	£500	G6
Stock control	£450	M5
Stock control	£199	T5
Stock control	£400	M9
Stock control	£249	P1
Stock control	£350	U1
Stock control	£495	C9
Survey analysis	£645	M6
Surveying	£500	G6
Time/cost recording	£400	G1
Time/cost recording	£200	M3
Time/cost recording	POR	W4
Time/cost recording	POR	G4
Time/cost recording	£750	M6
Time ledger	£350	B3
Typing tutor	£50-125	A5
Utilities	£50	B5
Various thermal insullation industry systems	£2000+	T4
Video hire system	£499	G4
Video hire	£795	L5
Word processing	£400	G1
Word processing	£260	C4
Word processing	£250	M3
Word processing	£250	S11
Word processing	£1000	B1
Word processing	£99	T5
Word processing	£295	X2
Word processing	£350	M12
Word processing	£295	M4
Work in progress	£850	B5
Famos		
Customer file	£1000	M2
Data base	£1500	M2
Integrated accts	£2000	M2
Motor dealer	£5000	M2
Payroll	£1500	M2
Stock control	£1500	M2
Word processing	£500	M2
Grundy 8200		
Bill of materials	£95	M10
IBMPC		
Bill of Materials	£390	H1
Building est	£325	C9
Building services	POR	H6
Database management	£295	M4
Invoicing	£390	H1
Job costing	£495	C9
Mailing list	£149	M4
Nominal ledger	£395	B2
Project management	£1600+	C11
Project management	£1100	M13
Project management	£1100	C11
Sales ledger	£390	H1
Stock control	£395	B2
Stock control	£495	C9
Word processing	£295	M4
Word processing	£375	B4
MCZ Zilog		
Earth parameter collection & quantification	£95	M10
Mail shot	£250	I1
Membership accting	£250	I1
Personnel records	£400	I1
MZ-80K		
Estate agent	£195	W1
Integrated accounts	£150	P2
Stock control/recording	£150	P2
North Star Horizon		
Budgeting package	£95	B5
Building services	POR	I3
Cash flow	£95	B5
Database management/information retrieval	£250	B3
Double glazing costing	£750	W1
Estate agent	£750	B5

PACKAGES

Application/Machine	Price	Code
Financial modelling	£95	B5
General ledger/NL	£250	B3
General ledger/NL	£400	M3
General ledger/NL	£400	B5
Hotel management	£750	H5
Incomplete records	£750	M3
Incomplete records	£250	B5
Incomplete records	£975	B3
Integrated accts	£950	B3
Integrated accts	£990	M3
Integrated accts	£690	B5
Integrated accts	£900	B5
Invoicing	£100	B3
Invoicing	£250	M3
Invoicing	£100	B5
Job costing	£350	M3
Letter writer	£150	M3
Mailing List	£195	W1
Mail shot	£90	M3
Payroll	£350	B3
Payroll	£390	M3
Payroll	Lease	W1
Property Management	£400	M3
Purchase ledger	£250	B3
Purchase ledger	£400	M3
Purchase ledger	£400	B5
Sales ledger	£250	B3
Sales ledger	£400	M3
Sales ledger	£400	B5
SL, PL + stock control	£900	B5
Stock control/recording	£450	B3
Stock control/recordng	£900	M3
Time/cost recording	£250	B3
Time/cost recording	£200	M3
Time/cost recording	£450	W1
Word processing	£250	M3
PET/CBM		
Assembler dev	£50	C2
Bill of materials	£199	T5
Bureau de change	£8	H3
Cash flow	£195	D1
Cheque writer	£90	P3
Credit control	£650	B4
Database management/ information retrieval	£50/150	C2
Database management/ information retrieval	£150	G2
Database management/ information retrieval	£150	J1
Database management/ information retrieval	POR	C1
Database management/ information retrieval	£225	H4
Database management/ information retrieval	£250	C3
File handling	£225	H4
File handling	£645	D1
Financial modelling	£250	D1
General ledger/NL	£200	C2
General ledger/NL	£1000	C1
General ledger/NL	£200	H3
General ledger/NL	£199	T5
Housing association package	POR	M7
Integrated accts	£(50)	C2
Integrated accts	£650	G2
Integrated accts	£650	J1
Integrated accts	£800	S3
Integrated accts	£199	T5
Invoicing	POR	J1
Invoicing	£400	C1
Invoicing	£199	T5
Job costing	£750	X1
Job costing	£199	T5
Mailing list	£35	H3
Payroll	£150	G2
Payroll	£150	J1
Payroll	£150	C2
Payroll	£50/195	I2

Application/Machine	Price	Code
Payroll	POR	C1
Payroll	£200/350	C5
Payroll	£10	H3
Payroll	£199	T5
Petsoft programs	£160	J1
Petaid report generator	£250	S3
Prise lister	£12	H3
Production control	£650+	P3
Purchase ledger	£200	C2
Purchase ledger	POR	J1
Purchase ledger	£1000	C1
Purchase ledger	£300	B4
Purchase ledger	£350	H3
Purchase ledger	£199	T5
Sales ledger	POR	J1
Sales ledger	£200	J1
Sales ledger	£300	B4
Sales ledger	£800	C1
Sales ledger	£350	H3
Sales ledger	£199	T5
Solicitor's complete record accounting	£3000	S2
Stock control/recording	£150	C2
Stock control/recording	£150	G2
Stock control/recording	£150	J1
Stock control/recording	£195	I2
Stock control/recording	£15	A2
Stock control/recording	£300	B4
Stock control/recording	£35/25	H3
Stock control	£199	T5
Utility set	£78	H3
VAT master	£25	H3
Word processing	£75/150	J1
Word processing	£75/150	G2
Word processing	£75/150	C2
Word processing	£375	H4
Word processing	£325	C5
Word processing	£35	H3
Word processing	£249	P5
PET/Computhink		
Stock control/recording	£250	R1
Philips P200		
Analysis ledger	£100	P4
Expense Analysis	£150	P4
General ledger/NL	£100	P4
Hotel billing	£500	P4
Incomplete records	£150	P4
Integrated accts	£650	P4
Invoicing	£150	P4
Job costing	£400	P4
Order processing	£200	P4
Payroll	£300	P4
Purchase ledger	£200	P4
Quotation estimating	£400	P4
Renewals ledger	£200	P4
Sales ledger	£200	P4
S/L, P/L stock control		P4
Time/cost recording	£300	P4
Word processing	£230	P4
RAIR Black Box		
Financial modelling	POR	A3
Hotel management	POR	A3
Local government housing maint.	POR	A3
Sharp PC-3201		
General ledger	£450	P2
Sales ledger	£300	P2
Purchase ledger	£300	P2
Sorcerer		
Bookshop stock control	£1450	L2
Car showroom sales	£1900	L2
Department store order program	£2500	L2
Health authority PPM	£2500	L2
Instrument logging	£500	L2



'It's the only way I can get him interested these days.'

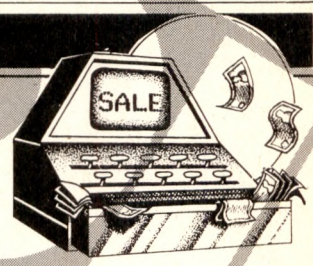
Application/Machine	Price	Code
Invoices	£290	L2
Mailing list	£290	L2
Payroll	£250	L2
Sales ledger	£490	L2
Solicitors package	£3500	L2
Stock control/recording	£390	L2
Tour operators package	£2900	L2
Superbrain		
Bill of materials	£450	T3
Database	£300	S6
Estate agent	£800	S6
General ledger	£400	M3
General ledger	£400	S6
Incomplete Records	£750	M3
Incomplete Records	£1200	S1
Integrated accts	£1200	S6
Integrated accts	£990	M3
Integrated accts	£1000	T3
Integrated accts	£1200	S1
Invoicing	£250	M3
Invoicing	£150	S6
Job costing	£350	M3
Letter writer	£150	M3
Mail shot	£90	M3
Payroll	£400	S6
Payroll	£390	M3
Payroll	£250+	T3
Property management	£400	M3
Purchase ledger	£300	S6
Purchase ledger	£400	M3
Sales ledger	£300	S6
Sales ledger	£400	M3
Solicitors package	£1400	S1
Stock control	£300	S6
Stock control	£900	M3
Stock control	£450	T3
Time/cost recording	£800	S1
Time recording	£200	M3
Word processing	£250	M3
Travel agency accts	£800	S6
S/L, P/L & stock control		
Apple II	£900	P2
Apple II	£1000	T2
CP/M	£1000	L3
CP/M	£900	B5
CP/M	£900	G4
CP/M	£1200	M9
Cromemco	£900	B5
North Star Horizon	£900	B5
Philips P2000	£950	P4
Solicitor's complete record accounting		
Apple II	£3000	S2
PET/CBM	£1785	D1
Solicitor's package		
Act Sirius 1	£1400	S1
CBM/8032	£1400	S1
Compucorp	£2000	Q1
CP/M	£1250	M5
CP/M	£750	M6
CP/M	£2000	M12
Sorcerer	£3500	L2
Superbrain	£1400	S1
Statistics		
Apple II	£150	G3
Apple II	£100-195	P2
Apple II	£140	C8
Tandy Model I	£45	S2
Stock control/recording		
Act Sirius I	£265	O1
Act Sirius I	£195	A1
Apple II	POR	K1
Apple II	POR	S5
Apple II	£150	G3
Apple II	£80	S2
Apple II	£75/300	P2
Apple II	£285	V1
Apple II	£500	S4
Apple II	£490	L4
Apple II	£199	T5
CBM/8032	£175	P3
CBM/8032	£199	T5
CBM/8032	£350	W3
Challenger	£25	C7
CP/M	£325	L1
CP/M	£750-1500	C4
CP/M	£350	G1
CP/M	£900	M3
CP/M	£700	B5
CP/M	£550	B5
CP/M	£250	B3
CP/M	£300	W1
CP/M	£395	G6
CP/M	£450	M5
CP/M	£300	B1
CP/M	£199	T5
CP/M	£500	G4
CP/M	£400	M9
CP/M	£249	P1
CP/M	£350	U1
CP/M	£495	C9
Cromemco	£700	B5
Famos	£1500	M2
IBM	£395	B2
IBM	£495	C13
MZ-80K	£150	P2
North Star Horizon	£250	B3
North Star Horizon	£900	M3

Application/Machine	Price	Code
PET/CBM	£195	I2
PET/CBM	£300	B4
PET/CBM	£150	C2
PET/CBM	£150	J1
PET/CBM	£150	G2
PET/CBM	£250	R1
PET/CBM	£35/25	H3
PET/CBM	£199	T5
Philips P2000	£300	P4
Sirius	£495	C9
Sorcerer	£390	L2
Superbrain	£900	M3
Superbrain	£300	S6
Superbrain	£450	T3
Tandy Model I	£30-50	M1
Tandy Model II	£300	M1
Tandy Model I	£48	S2
Tandy Model I	£200	H1
Tandy Model I	£115	J1
Tandy Model I	£200	T1
Tandy Model I	£375	T1
Tandy Model II	£265	O1
8080/Z80	£275	G3
8080/Z80	£325	L1
Storage tank costing/volumes		
Apple II	£150	S10
Survey analysis		
CP/M	£645	M6
Surveying		
CP/M	£500	G6
Text file librarian		
Apple II	£125	S4
Time/cost recording		
Act Sirius 1	£800	S1
Apple II	£450	S2
CBM/8032	£800	S1
CP/M	£400	G1
CP/M	£200	M3
CP/M	£250	B3
CP/M	POR	G4
CP/M	£750	M6
CP/M	POR	W4
North Star Horizon	£250	B3
North Star Horizon	£200	M3
North Star Horizon	£450	W1
Philips P2000	£300	P4
Superbrain	£200	M3
Superbrain	£800	S1
Tandy Model I	POR	M1
Tandy Model II	£575	M1
Tour operators package		
Sorcerer	£2900	L2
Travel agency accts		
Superbrain	£800	S6
Tandy Model I		
Database management/ information retrieval	£25-50	M1
Database management/ information retrieval	£270	A4
Database management/ information retrieval	£60	S2
Database management/ information retrieval	£32.50	M11
Database management/ information retrieval	£150	J1
General ledger/NL	£90	M1
General ledger/NL	£200	M1
General ledger/NL	£225	M11
General ledger/NL	£225/325	T1
General ledger/NL	£425	T1
Incomplete records	£25	M1
Incomplete records	£40	M11
Invoicing	£90	M1
Invoicing	£280	A4
Invoicing	£200	M1
Invoicing	£75	T1
Invoicing	£125	T1
Invoicing	£265	O1
Integrated accts	£300	M1
Integrated accts	£550	A4
Integrated accts	£600	M1
Integrated accts	£75	J1
Integrated accts	£795	O1
Investment portfolio	£20	S2
Invoicing	£25	M11
Job costing	£265	O1
Mailing list	£40	M1
Mailing list	£75	M1
Mailing list	£25/38/55	M11
Mailing list	£50-150	S2
Mail shot	£75+	G4
Mail shot	£160	A1
Mail shot	£75+	G4
Payroll	£200	M11
Payroll	£218	T1
Payroll	£375	T1
Payroll	£300+	O1
Purchase ledger	£90	M1
Purchase ledger	£200	M1
Purchase ledger	£225	M11
Purchase ledger	£375	T1
Purchase ledger	£375	T1
Sales ledger	£90	M1
Sales ledger	£90	M1
Sales ledger	£225	M11
Sales ledger	£225	T1

PACKAGES

Machine/Application	Price	Code
Sales ledger	£375	T1
Statistics	£45	S2
Stock control/recording	£30-50	M1
Stock control/recording	£300	M1
Stock control/recording	£200	M11
Stock control/recording	£48	S2
Stock control/recording	£115	J1
Stock control/recording	£200	T1
Stock control/recording	£375	T1
Stock control/recording	£265	O1
Time/cost recording	POR	M1
Time/cost recording	£575	M1
VAT register	£15	M11
Video hire system	£460	A4
Word processing	£74	M1
Word processing	£200	M1
Word processing	£45/95	J1
Word processing	£15	M11
Word processing	£30/60/90	S2
Word procesing	£295+	O1
UCSD-p		
Financial planning	£350	S4
General ledger	£350	S4
Invoicing	£350	S4
Job costing	£350	S4
Micro finesse plus	£475	S4
Payroll	£350	S4
Purchase ledger	£350	S4
Sales ledger	£350	S4
The administrator	£175	S4
Word Processing	£175	S4
Vector		
General ledger/NL	£400	C5
Integrated accts	£1000	C5
Purchase ledger	£400	C5
Sales ledger	£400	C5
Word processing	£40	C5
Victor 9000		
Integrated Accts	£1250	I4
Order processing	£400	I4
Payroll	£600	I4
Project management	£1600+	C11
Project management	£990	M13
Purchase ledger	£325	I4
8000 Series		
Database management/information retrieval	POR	C2
Integrated accts	POR	C2
Payroll	£250	C2
Purchase ledger	£250	C2
Sales ledger	£250	C2
Word processing	£250	C2
8080/Z80		
Bill of materials	£390	H1
General ledger/NL	£275	G3
General ledger/NL	£375	L1
Integrated accts	£950	L1
Integrated accts	£995	G3
Invoicing	£325	L1
Invoicing	£390	H1
Job order control	£257	G3
Order processing	£550	L1
Payroll	£475	L1
Payroll	£275	G3
Prof appts groups	£275	G3
Prof appts individ	£220	G3
Prof client billing	£330	G3
Purchase ledger	£425	L1
Purchase ledger	£275	G3
Sales ledger	£275	G3
Sales ledger	£425	L1
Sales ledger	£390	H1
Stock control/recording	£325	L1
Stock control/recording	£275	G3

TRANSACTION FILE



Readers will be pleased to know that, due to our clever layout ideas, the Transaction File is up-to-date and waiting cut down considerably. Ads are accepted only on the form below for a flat fee of £2.50. Please don't specify issues as we can't oblige. Ads cannot be repeated unless separate forms are sent in. We will only accept entries from non-commercial readers. Thank you for cooperating.

● Micronet 800 acoustic coupler with latest BBC software. Works perfectly — hardly used. No longer needed. Snip at £40. Tel: Spen (0926) 38751 (home).

● 96k Lynx, upgraded by Camputers. Includes cable and software for serial printer, also Lynx book, newsletters and other software. Must sell. Offers over £200. Tel: 01-658 0645.

● Gemini computer: Z80, 64k, 8 slot card cage, psu, keyboard, £250. BASF 6106 disk, £120. Centronics P1 printer, £100. Tel: Cambs (0480) 68967 (eve).

● Hewlett Packard HP-41C programmable calculator. Hardly used, boxed, with all manuals, case etc, as new, £100 ono. Tel: Birmingham (021) 554 0018 (after 6pm).

● Sharp MZ80A + dual discs + printer, software, Pascal, stock control, Invaders. Two year guarantee with Stanton & Lewis (Cardiff). Little used, upgrading, may split. Any reasonable offers. Tel: Jonathan Frey, 02227 54673 (eve).

● DRE 8in DSDD floppy disk drive, 1.6MB unformatted. Very good condition, but no case or PSU. Offers, buyer collects, Northampton. Tel: (0604) 412785 (after 6pm).

● Sharp MZ80K 48k, + Pascal, Forth, enhanced Basic, software, books, cover, reset. Excellent self-contained machine for serious learner. Buyer collects, £275. Tel: Coventry (0203) 464308 (eve).

● IBM PC 2×320k drives, 192k RAM, some software, one year old. Offers. Tel: (0953) 602951, Wymondham, Norfolk (after 6 o'clock).

● Video Genie EG3003 16k + manuals, books, Invaders, Flight Simulation and Chess for £90. Write to: R. Denman, Apple Tree Cottage, Rockland St Mary, Norwich, Norfolk. Low price for quick sale.

● Video Genie 48k, lower case, sound, + software, Z Chess, Adventure, Jumbo, £250 including printer interface, Aculab floppy tape for Genie + Xbas, @SCRIP(SIT), £125 or £350 the lot. Tel: Wolverhampton 341333.

● PET 32k. Large keyboard, tool kit, cassette, large amount of software, including assembler/disassembler handbook, £350. Tel: Wellington 3737 (office hours), or write John Sparks, 3 Drakes Park, Wellington, Somerset.

● Printer, excellent condition ASR33 computer terminal suitable as printer or keyboard entry terminal. RS232 and paper tape, £75. Also similar for spares, offers. Tel: 024541 2777.

● Tandy TRS-80 Model III 16k. One year old. Hobby use only. Very good condition. Manuals, software. No disc drives, £400. Tel: (061) 477 5379 (after 6pm).

● Sharp MZ-80K, 48k, 18 months old; excellent condition with manual, Basics, and over 60 games, including, Space Invaders, Asteroids, Galaxian. Also magazines. Only £270. Tel: 0935 27070 (after 6pm).

● Apple II Z80 card, 80 column card, CP/M system disk. The lot for £199. Printer (Centronic), interface card and cable, £65 ono. Osborne 1 computer, £650. Tel: Anthony, 01-690 6871 or 01-690 5860.

● 16k Video Genie. Excellent condition, boxed as new. Soundbox, extra manuals, variety of software, including Asteroids, £210 ono. Tel: David Caddick, Liskeard, Cornwall 43376 (after 4.30pm). All leads included.

● Sharp MZ80K, 48k. Reset switch and cover, extended Basic, Software and books. Also Seikosha GP80D compatible printer with interface and word processor, good condition, £375 ono. Tel: Andy (061) 202 2678.

● 2 Shuggart SA400L disc drives 5¼in floppy. Sold separately or together, £155 each. Almost new, recently workshop aligned. Tel: Steve Armitage, 01-435 1894 (after 6pm).

● Acorn ATOM 12k, floating point, VIA, printer drive, BBC Basic, colour, power supply, £50. Software including, Forth, games packs, Bug-Byte, A&F etc. All for £150. Tel: 01-670 6958 (eve).

● Disk drives and control card for Nascom. 2 drives 8 inches, as new. Lots of software for CPM. First offer over £275. Tel: Lydd 20960, Kent (after 6 or weekends).

● Sharp MZ80K + MZ80P3 + MZ801/0. Lots of software and user notes, might split, £550. Tel: Eastbourne (0323) 840209.

● TRS80 Level II 16k computer, line printer VII, green screen monitor, cassette, books, software, £350 ono. Tel: Worcester (0905) 358006.

● Cheap easy 32k RAM expansion for any 6502, 6800, 6809 system. 4k block selectable, £27.50. Powertran 8k RAM expansion, £5. FDC chip 1793 (equiv), £10. Full data sheets included. Tel: Adams (0482) 651203.

● Northstar Horizon 48k. Twin disc drives, Newbury 7000 keyboard, VDU LA34, Decwriter printer used for experimenting on accounting programmes, Northstar Basic CPM, Microsoft Basic. Bargain £1,000. Tel: Brentwood 811415 (eve).

● Video Genie EG3003 16k. With sound, l/case mod and software inc, edt/assm monitor and games + manuals, cassette, leads etc, £175 ono. Tel: Immingham (0469) 77661.

● TRS80 Model I accessories, 26-1181 voice recognition, £27. Video monitor (black filter), £26. Light pen, £14. Carry case, £12. 26-1180 speech synthesiser, £49. Tel: (061) 440 8569.

● Commodore 4032 12in screen with 2 softchips provide 40 useful commands and supersoft wordpro + many copies of PCW, offer around £550. Address: P.M. Lee, 200 Stanley Road, Teddington, Middx TW11 8UE.

● Sharp MZ80K 48k. Hardly used. Manuals, some games, £250. Tel: Canterbury (0227) 51629.

● TRS-80 16k LII, VDU, LP VII printer + interface. All manuals, leads inc £200 + of software (Edtasm, Accel 3, Scripsit + many games inc, Robot, Galaxy), £400. Tel: 0279 54266 (eve).

● For sale: EX702P + FA2 cassette/printer interface + manuals. Also some back issues of Microcomputer printout, Dec 1981-May 1982 + others, £55. Tel: 01-958 6883 and leave message for Sheldon.

● Video Genie 48k. Built in cassette recorder. Sound, dual joysticks, manuals, books and dust cover, £150. Software including editor/assembler, graphics and games. Quick sale therefore, £250. Tel: Staines 62947.

● 16k ZX Spectrum with 32k upgrade. Boxed with manuals and games book. Also £50 worth of software. Worth over £200, only asking for £120. Tel: Fife (0592) 860 592 (after 5pm).

● Atari 400. 9 months old. Cassette player, Basic cartridge with Basic manual, joysticks, over £100 worth software including, Donkey Kong, Zaxxon, Starraiders, £225. Tel: 01-698 7614 (eve).

● Atari VCS + 2 joysticks, 2 paddles adapter cartridges, Berzerk, Defender, Adventure, Combat, Haunted House, worth £186, will accept £110. Tel: 01-995 3420 (after 5pm) excellent condition, boxed.

TRANSACTION FILE ADVERTISEMENT FORM

All Transaction File ads must be submitted by readers on this form or a photo-copy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by a flat fee of £2.50. Make cheques or POs payable to Personal Computer World. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send form to: Transaction File PCW, 62 Oxford Street, London W1A 2HG.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

TRANSACTION FILE

● Acorn ATOM, 12k + 12k, colour, PSU, much software, teletype interface, £175. KSR33 teletype, excellent condition, £75. Tel: H. Mardia, Maidenhead (0628) 23062 (eve).

● BBC Model B OS1.2. 15 months old, + leads, 3 manuals and many games tapes, mainly Acornsoft, £350. Tel: 01-422 0764 (eve).

● OHIO scientific C28-P. Twin 8in discs = ½ MB, 48k RAM. OS-65U operating system and MBasic. Televideo 920 VDU cables, discs and manuals, £895 ono. May sell separately.

● ATOM 14k, 44k, word processor, atomcalc, toolbox, via, printer, interface, 64-way edge connector, BBC Basic, dis-assembler, Invaders, Galaxian, Minefield, Breakouts. Some books, joystick, tape deck. Bargain £220. Tel: (0482) 898466.

● SuperPET 9000 Learn powerful APL, also Pascal, Fortran, Basic, 6809 assembler + Superscript. 8050 disks, Acculab interface. Epson MX80 F/T III printer, study use only. Nice machine, £2,850 ono. Tel: (061) 928 4958.

● 4.0 PET 32k for sale. Excellent condition. Cassette drive, manual, lots of software, really low price, £295 ono (need money). Tel: David, Sunderland (0783) 227262 (after 6pm). Urgent sale required.

● Sharp MZ-80K. 48k. Boxed. Excellent condition. Includes manual, 2 Basic cassettes, applications cassette and selection of games, £280 ono, bargain. Tel: 061-485 2119.

● MZ-80B perfect condition, 64k RAM Hi-res graphics, integral sound, screen and cassette. Basic, Pascal, Z80, assembler, manuals, dustcover, original packaging. £550 ono. Tel: Paul, 01-262 7996 (after 4pm).

● Sharp MZ80K + Epson MX80FT3 printer, direct interface, + over £400 worth of applications, languages, utilities, games, £500 ono, will separate. Tel: (0429) 74085 (after 5pm).

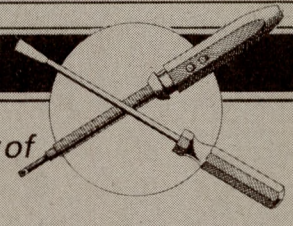
● Commodore CBM 4016 16k. Including built in monitor, and with C2N cassette drive + 100 programs. Excellent condition, as new. Tel: Mitchell on Southend (0702) 588601. No reasonable offer refused.

● Centronics 588 matrix printer, 88 CPS, upper and lower case. Parallel centronics and serial interfaces. Documentation. Excellent condition, £95 with box of 11 × 9½ paper. Tel: Romford (0708) 42475.

● MZ-80K/A software for sale Centipede, Scramble, Missile Command, Defender, Flight Simulator, Visicalc, Wordpro, assembler, disassembler, speech Synth, Forth, several Basics and many others, £2 to £8. Tel: Maidenhead (0628) 23162 (eve).

● Assemblers on 32k PET + disc. Fast 200 LPM, 6801/3, 6301/3, 6802, 6809, £18 each processor. Sae details, M.J. Tyler, 2 Parkview Drive, Cashes Green, Stroud, Glos GL5-4NQ. Tel: 0453 77257.

ACC NEWS



This month Rupert Steele gives full details of the ACC and conducts a tour of London clubs.

ACC details

I can now reveal full details of the **Association of Computer Clubs**. The old ACC has now split into two new organisations — the **Amateur Computer Club**, which publishes a hardware magazine called *Accumulator*, and the **Association of Computer Clubs**, which will serve to link together computer clubs around the country. Both groups have the initials ACC, but I'll use the abbreviation exclusively to refer to the Association.

So what's new about this Association? Well, for one thing it is democratic, run by and for computer clubs and user groups in the UK. Every club or user group paying the affiliation fee is entitled to voting representative(s) at ACC Council, the new governing body for the common interests of the computer hobbyist movement.

The Council elects an Executive Committee, which is responsible for conducting the day to day business of the Association of Computer Clubs. At the moment, there is a temporary Steering Committee running the Association until the first Council meeting, projected for the end of January 1984. For the time being I have taken on the job of chairman of the Association.

Other components of this Association are the four 'specialist groups'. These are semi *ad hoc* working groups which will look after special aspects of the Association of Computer Clubs. The four groups are:

1. **COMMS** — Communication group. Responsibilities are listed in Prestel and similar database systems. This group doubles as the ACC National Prestel Committee, which has been running Club Spot 800 on Prestel. The current chairman is Peter Whittle.

2. **TAGS** — The technical advances group coordinates club interest in new technical advances. Its chief interest at the moment is micro-robotics (there will be a conference on this subject soon), but other new fields are waiting to be explored. Computer applications to help the disabled are also in the TAGS queue. Chairman of TAGS is Vernon Gifford.

3. **LUGS** — Liaison for User Groups and Shows. This group is to look after the National User Groups and the coordination and allocation of free (or very cheap) stand space at exhibitions. The LUGS group plans out space for 'Club Avenue' features at exhibitions, and edits a news sheet telling the National User Groups what is going on. Current chairman of LUGS is David Annal.

4. **CLUES** — Clubs and Exhibition Stand. This group looks after the relations between the ACC and the various local computer clubs. The group maintains the ACC list of computer clubs: now numbering some 500, this list is believed to be the most accurate and up to date in the country. It is generally taken (on a computer) to the larger computer exhibitions, where visitors are put in touch with their local computer clubs. Current chairman of CLUES is Tom Cranstoun.

These four groups operate on as near an 'open house' basis as is practicable, and we are interested to hear from anyone who would like to get involved. Please write to me, and I'll pass your letter on.

How can you get involved? As an individual, you can join ACC Council for a nominal fee of only £2 a year. This entitles you to attend ACC Council meetings (but not to vote) and to stand for election to the various Association Committees. You will get an occasional information sheet, which is what the £2 pays for.

A local computer club can affiliate to the ACC for the sum of £6 per year, which is again principally to cover the costs of keeping in touch. Affiliated local clubs will be able to send a voting representative to ACC Council. They will also get extra publicity through handouts at exhibitions and further rights on Club Spot in Prestel. There will be an occasional local club news sheet. We are looking into other services clubs will be able to get at reduced rates by acting together (any ideas?).

Finally, the national user groups are also able to affiliate to ACC, for a subscription that is negotiated according to the group's size. The ACC looks after these groups' interests in a variety of ways, including the operation of the Club Spot 800 and the arranging of exhibition stands.

Around the clubs

This month's tour of the local clubs is in London and the Home Counties. Mr Chris Powell of 24 Stapenhill Road, Wembley HA0 3JJ writes to tell me he is starting a club in the Wembley area. He has organised a computer games contest to make money for his local church heating appeal. That's an interesting idea — perhaps you would let me know of any other ways of making money for charities using home computers?

Dr Leo McLaughlin writes to tell me of the North London BBC Micro Users' Group. It is University based (but open to all) and therefore has access to a wide range of skills and expertise. At the time of writing, meetings are held at the Prince of Wales, 37 Fortune Green Road, but this was planned to change. Write to Dr Leo McLaughlin, North London BBC Micro Users' Group, Dept of Chemistry, Westfield College, Kidderpore Avenue, London NW3 7ST.

Colin Seymour writes to describe the British Airways Computer Club. High fliers should write to him at 36 Hunters Hill, High Wycombe, Bucks, HP13 7EW. This club may be BA only, but contact him if you're in the area for details.

Val Weston of Hillcote, 69 Petersfield Road, Midhurst, West Sussex GU29 9JY writes to tell me of the Midhurst (and district) computer User Group (MUG). It meets at the Grange Centre in Midhurst on the second and fourth Thursday of each month and welcomes all kinds of members from novice to expert. It is also planning a junior group and many further activities. Ring Val on Midhurst 3876 or write to her at the above address.

Lucas Fowler writes to me to say he is now secretary of the Queens Crescent Computer Club. The club has recently become a member of the Association of London Computer Clubs (ALCC). It caters for the whole range of enthusiasts from beginner to expert, and

ACC NEWS

meets on Tuesdays at the Queens Crescent Library, 165 Queens Crescent, London NW5 4HH. Write either to the club c/o the library or to Lucas Fowler, 47 Woodsome Road, London NW5 1SA or ring 01-485 7730 for further information.

And finally, Mr JR Griffin writes to me from 1 Garrard Road, Slough, Bucks to tell me about a new group in the Slough area for users of the Dragon 32. Called The Dragon 32 Users' Group, Slough Branch, it has been rapidly growing. Write to Mr Griffin for full details.

Remember . . . for information about the individual clubs, write to the address given. For information about the Association of Computer Clubs, or to join, write to me:
Rupert Steele
17 Lawrie Park Crescent
London
SE26 6HH
Tel: 01-778 6824.

BENCHMARKS

A listing of the Benchmarks used when evaluating micros is given below. An explanation can be found in the December '83 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

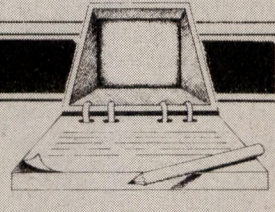
```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 220
170 FOR L=1 TO 5
180 NEXT L
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXT L
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

DIARY DATA



Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

Orlando	(Mini/Micro South East) Computer Conference & Exbn. Contact: Electronic Conventions Inc, Los Angeles.	17-19 Jan
Birmingham	(NEC) Which Computer? Show. Contact: Clapp & Poliak Europe Ltd, 01-747 3131.	17-20 Jan
London	(Central Hall Westminster) Computers in Education Exbn — Acorn. Contact: Computer MarketPlace Ltd, 01-930 1612.	25-27 Jan
London	(Wembley Conference Centre) Microprocessor Development Show. Contact: Project Presentations Ltd, 01-242 3621.	31 Jan-2 Feb
London	(Cunard Int) Peripherals Suppliers Exbn. Contact: Reed Exbns, 01-643 8040.	31 Jan-2 Feb
London	(Kensington Town Hall) Microcomputing Exbn — Apricot & Sirius. Contact: Paradox Group Ltd, 01-241 2354.	7-9 Feb
London	(Heathrow Penta) Int Home Computers, Videogames & Software — LET. Contact: Wheatland Journals Ltd, (0923) 774 262.	13-15 Feb
London	(Int Press Centre) Computer Seminar & Exbn. Contact: London Science Centre, 01-839 4901.	14-15 Feb
London	(Barbican Centre) Information Technology & Office Automation Exbn & Conference — INFO. Contact: BED Exbns Ltd, 01-647 1001.	21-24 Feb

YANKEE DOODLES



IBM PC Junior under scrutiny . . . personal computers made more user-friendly by new Visicorp package . . . unauthorised use of computers investigated by FBI . . . Sol Libes reports from Stateside.

Random rumours

Commodore is rumoured negotiating with Mark Williams Company, Chicago, Illinois, to use the latter's Unix-like Coherent operating system on Commodore's Z8000-based, 16-bit micro-computer now in development. The minimum system is expected to include 128k of RAM and a 320k disk drive and sell for under $800. An 8088 plug-in card option is also expected . . . Commodore is also rumoured to be preparing a portable computer employing a 16 line by 80 character liquid crystal display and wafer-tape drive . . . Texas Instruments is rumoured working on a 68000 processor card with Unix-type operating system for its desktop IBM PC compatible system . . . IBM is rumoured to be preparing an optional Selectric-type keyboard for its PC . . . IBM is expected to make 1.2 million PC Junior home computers this year and is reportedly also preparing to introduce an enhanced PC Junior shortly which it expects will be even more popular than the unit recently introduced. There are rumours that it is getting parts quotations to build three million of these units over a one year period . . . Gavilan Computer, which introduced its radically new portable computer last May (see page 168), is not expected to start shipping until March, ten months after its introduction. The hang-up seems to be the software for its integrated operating system and applications software which utilises a mouse-like touch panel . . . Coleco is rumoured to be preparing a new, high-end system that will be upward compatible with its Adam system. This probably means that it will use a disk drive in place of its 'stringy floppy' . . . Morrow Designs is expected to announce transportable and portable machines compatible with the IBM PC . . . the first IBM PC clone from Taiwan is expected shortly from Multitech Electronics. It is already selling an Apple clone . . . North Star is expected to introduce a multi-user system compatible with the IBM PC that supports 12 users . . . There are rumours that IBM is to start building hard disk drives for the XT in house . . . Lotus Development Corp is rumoured negotiating to buy an as yet unannounced Pick-like operating system for the PC/XT . . . IBM is rumoured working on versions of the PC XT as integrated data/voice workstations and PABX peripherals . . . IBM is expected shortly to start production of the PC and XT in Australia, adding a third plant to the two already in operation in Boca Raton, Florida and Greenock, Scotland . . . Mattel Inc, maker of the Aquarius home computer, is rumoured getting ready to follow in TI's footsteps and exit the home computer business . . . Bank of America is expected to announce a 'Personal Computer Account' for owners of home computers who want to conduct bank transactions using their systems and the phone lines. Open the account and it will deposit $24 to start it off. Fee will be $8 a month.

★ ★ ★ ★ ★ ★ ★ ★ ★

Apple news

There are also rumours that Apple will soon introduce a colour version of the Lisa computer as well as windowing and mouse capabilities for the II and III . . . and look for Apple to unveil a laser printer. It's also expected that Apple will standardise on the Sony type 3.5in disk drive for all future products.

Apple Computer and Rana Systems Inc have entered into an agreement to provide a disk add-on system for the Apple II which will provide IBM PC compatibility. The add-on will provide two 360k drives, an 8088 processor, 256k of RAM and the MS-DOS operating system for just under $2000. The success of this product is uncertain since it costs more than the Apple itself.

Apple's Elf transportable computer (rumoured in this column previously) should be announced by the time you read this. The unit is expected to use a 6500-type processor and will have a high level of Apple II compatibility. It should have 64k of RAM expandable to 128k with some expansion slots on the motherboard. It will use a microfloppy drive and so the overall unit will be physically much smaller than the Apple II. RS232 and centronics ports are expected to be standard. A true battery operated portable CMOS version is expected soon.

Many Apple dealers reacted to the introduction of the IBM PC Junior by dropping the selling price of the Apple IIe to under $1000.

★ ★ ★ ★ ★ ★ ★ ★ ★

A look at IBM's PC Junior

The PC Junior (Benchtested next month) is far from the least expensive home computer system on the market.

What it has going for it are those three magical letters on the front, 'IBM'. And just as the PC/XT has become the *defacto* standard for office desktop systems, the PC Junior is expected to introduce a standard into the home/educational computer market where no compatibility currently exists. The lack of compatibility between systems is so bad that there is no compatibility between machines made by the same manufacturer (for example, Commodore, Atari, Apple). Thus the PC Junior's contribution to the home business market may be that it will finally bring some level of compatibility among software and peripheral products. It certainly offers nothing new in the way of technology or compatibility.

Companies who wish to compete at the upper end of the home computer market are expected to provide PC Junior compatibility. The companies who succeed here will be the ones who offer a lower cost combined with some additional value over what is offered on the PC Junior. Also, the success of PC Junior clones will depend to a great extent on IBM's ability to meet the market demand. One of the main reasons for the success of the PC/XT clones has been IBM's inability to catch up on demand.

Also, IBM is currently limiting distribution to its existing marketing channels. There is little doubt that later this year IBM will increase its distribution channels to mass marketing channels. It will be at this point that companies such as Commodore, Atari and Coleco will begin to feel the competition.

It is also expected that this year will see the Japanese entering the home computer market in the US with machines designed specifically for the US market. The Japanese have previously tried entering the US market with machines that have been very successful in the Japanese home market. These attempts have not met with success. The next wave of Japanese home computers

and that it might be out even before Microsoft's windows.

It's unlikely that all these suppliers will be successful in the market-place and intense competition between them is expected.

★★★★★★★★★

P-CP/M in beta test

Digital Research of Japan has disclosed that it's beta testing pre-production home computers using the new CP/M-in-ROM operating system. Reportedly, these units use an IC which integrates the system software ROM and processor into one IC, and will make possible the selling of CP/M-based systems for under $250. This version of CP/M is being referred to by DRI as 'P-CP/M'.

Systems using P/CP/M are expected to compete with home computers using the new Microsoft MSX operating system. Several Japanese personal computer makers have already announced MSX based systems.

★★★★★★★★★

Radio Shack news

Radio Shack has introduced an IBM PC compatible computer called the Tandy 2000. It has 128k of RAM, half height drives that store twice as much as the IBM PC, twice the colours and pixel density, and it uses the 80186 microprocessor, running at almost twice the clock speed of the IBM PC's 8088 (the result is about four times the processing speed). Selling for $2750, it is over 20% less costly. One of the most surprising things is that on the day Radio Shack announced the unit, it was demonstrating it in its computer centres.

The Tandy 2000 is representative of the newer IBM PC clones that are coming to market, which are more powerful and faster than the IBM PC and thereby create some compatibility problems. It is expected that IBM will switch to the 80186 and an improved colour display controller for its PC/XT to meet competition. It is also expected that the 80186 will be in short supply and so may cause delivery problems for vendors using it throughout this year.

★★★★★★★★★

Large LCD screen

Crystalvision, Sunnyvale, Ca, is the first company to announce a flat panel LCD display device capable of displaying 25 lines by 80 characters. The company is promising that initial production quantities will be available this month at $345 in 1000 quantity lots.

The unit will have an 8in diagonal measurement (1in larger than the Osborne Executive) and store permanent images. Thus it will not have to be refreshed as do the current LCD displays. It will provide a pixel density of 640 x 250 (IBM PC has 640 x 200) and a nearly 90 degree viewing angle (currently LCD displays have a typical 20 degree viewing angle). The unit is less than 1in thick and is 10in x 7in overall. Crystalvision also claims that the contrast ratio is far better than current LCD displays.

This appears to be a significant jump over LCD devices shown at the recent Japan Electronics Show by Japanese companies, and may put the US back in the running in display technology.

★★★★★★★★★

16-bit version of 6502

When Commodore scrapped the 16-bit microprocessor it had been developing for several years in favour of the Zilog Z8000, it left the market wide open for an upward compatible 16-bit version of the 6502. And sure enough, a company has seized the opportunity. Western Design Centre Inc, Mesa, Arizona, has announced a 16-bit microprocessor that runs 6502 software, in an emulation mode, without revision. The CMOS chip can address 16Mbytes of memory compared to the 6502's 64k. It has an 8-bit external bus and internal 16-bit bus. The most amazing feature is that it's pin compatible with the 6502. Just remove the 6502 from its socket and replace it with the W65SC816. Then just set the E bit in the status register and it performs just like the 6502. If the bit is off, the device becomes a 16-bit device.

★★★★★★★★★

New computer crime laws

The state of Wisconsin is working on a law that will make unauthorised destruction or alteration of computer records a felony, with a fine of up to $10,000 and 10 years in prison. Further, it outlaws computer programs that search through local telephone exchanges for computer dial-up tones, and bulletin board systems which include information on how to break into computer systems. About 20 other states already have laws on their books aimed at criminals who break into systems for financial gain, or who damage computer records.

★★★★★★★★★

Victor problems

Chuck Peddle, founder and president of Victor Technologies, has been 'relieved' of the operation of the company and assigned to product development. Chuck, for those who might not know, was the designer of the 6502 microprocessor and Commodore PET, the first integrated personal computer.

VT, founded only two years ago, now owes about $50 million and has laid off about half of its 2000 employees.

★★★★★★★★★

FBI traps computer intruders

The Federal Bureau of Investigation has begun investigating unauthorised use of computers using a 'trap and trace' technique. The FBI recently revealed that it had detected unauthorised use of the GTE Telenet system by trapping calls to a certain number and tracing their origin. Correlating this information with the time of the unauthorised entry into the system, it became the basis for the searching of homes around the country for other evidence of the computer break-in.

★★★★★★★★★

Random news bits

Apple has finally released the hardware/software package to allow its Lisa computer to access IBM, Digital Equipment and other computers. This fulfils a rumour which previously appeared here... Tandy has finally begun shipping CP/M for its Model IV computer, nine months after it was first announced... Panasonic, Sanyo, IT&T and Sperry have finally decided that they too have to jump into the already crowded IBM PC compatible computer market (good luck!)... Digital Research has replaced Microsoft on a project to develop a Unix operating system for Intel's 80286 microcomputer... Apple is now offering a 30% discount to schools. IBM generally offers 20% off to schools.

END

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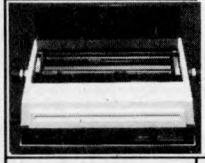


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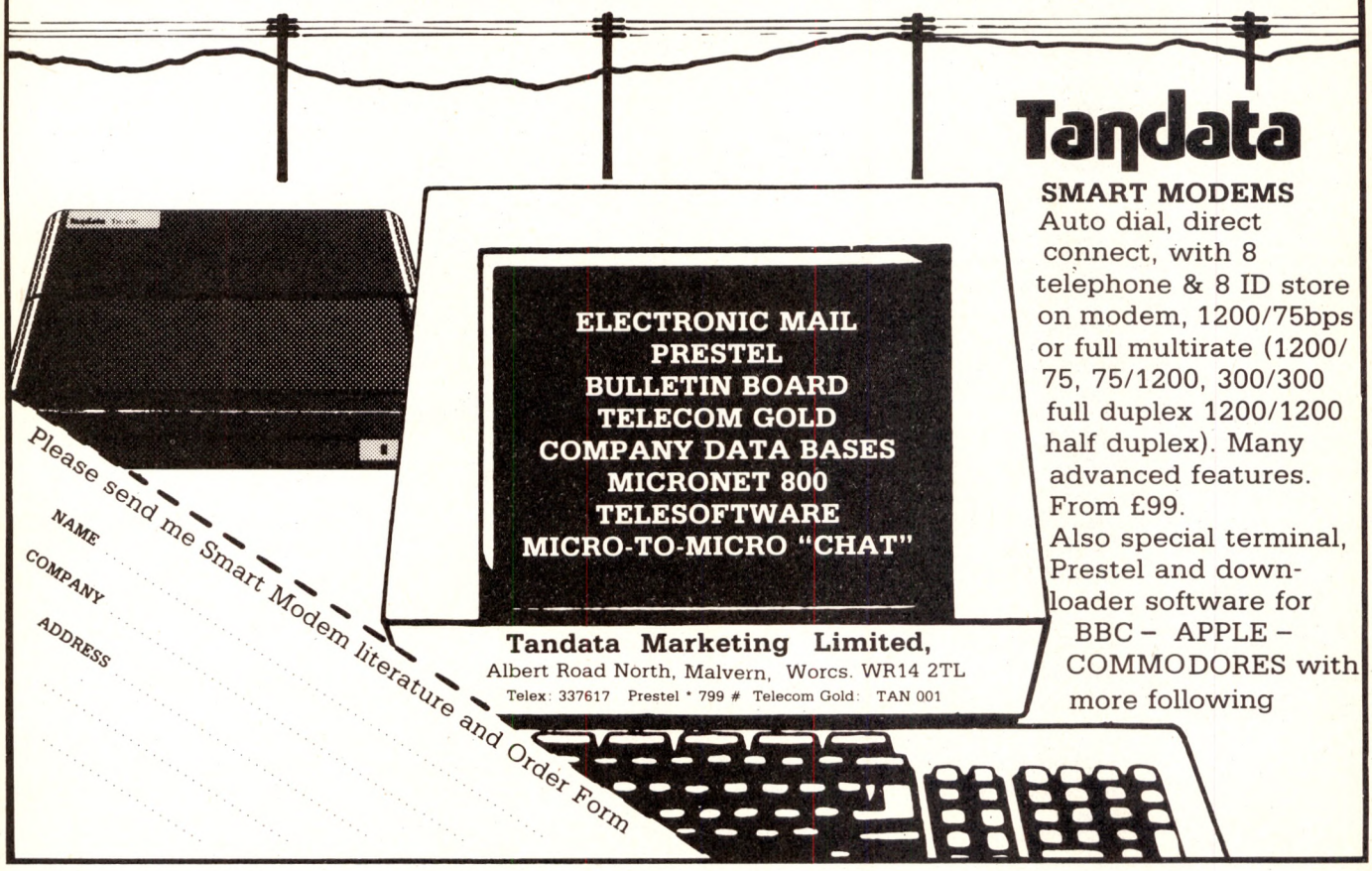
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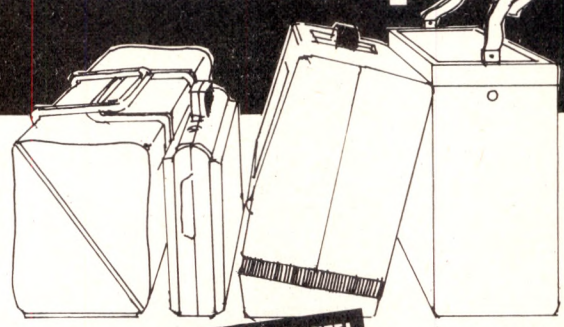
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are expected to be based on standard operating systems offered by Microsoft and Digital Research. The MSX system from Microsoft has been adopted by several Japanese manufacturers. Some of the systems are already on sale in Japan and are expected to be introduced in this country shortly. CP/M, the popular disk operating system from Digital Research, is currently being moved into hardware by the Japanese: a single chip is being developed which includes the software and processor. These CP/M-based systems are expected to be very low in cost and offered by several manufacturers.

The home computer market is something brand new for IBM. It realises the consumer electronics business is treacherous and is approaching the marketing of the PC Junior very cautiously—especially after looking at what has happened to companies such at Texas Instruments, Atari and Mattel. This caution is evidenced by IBM initially limiting the distribution of the PC Junior to its traditional distribution channels. This means that for the near future, until IBM sees what the market response is to the unit, it will limit its distribution to about 1000 traditional computer stores, and its own computer stores. By contrast, companies such as Commodore and Atari, who are selling primarily through mass merchandisers and electronic speciality chains, have well over 10,000 outlets each selling their products.

A second thing that indicates IBM's cautious approach to the PC Junior is that it has contracted out the entire production of the unit. The PC Junior is being manufactured by Teledyne in its plant in Lewisburg, Tennessee; if IBM finds that sales of the PC Junior are not up to expectation it can easily pare back its commitment, by shifting the manufacturing burden to another party.

IBM will mount the most expensive and aggressive promotional effort ever for the PC Junior. It will probably spend well over $100 million on space and TV advertising in '84, which is as much as all the competition put together.

The disk version of the PC Junior will run essentially the same disk operating system as the PC/XT and hence will run many of the programs designed for the PC/XT: programs such as EasyWriter and Multiplan will run on the PC Junior. However, programs such as Lotus 1-2-3, which makes special calls to the IBM PC ROM and needs more than 128k of RAM, will not run on the PC Junior. It's likely that Lotus will bring out a special PC Junior version of Lotus.

IBM has taken special care in designing the PC Junior to minimise any erosion on the sales of the PC. Thus, the PC Junior is not easily expandable and lacks the keyboard of an office machine. Further, because of the way the machine is designed, suppliers of peripheral products such as keyboards, memory and I/O functions cannot easily or economically upgrade the product the way they can upgrade the PC and XT.

★★★★★★★★

Androbot off to rocky start

Nolan Bushnell, founder of Atari, not too long ago founded Androbot to design and market low cost robots for home and educational use. Early last year it introduced its first unit called 'Topo' for $495. Androbot reports that sales of the unit have so far been very disappointing. Of the 650 made only 125 have been sold and the company has racked up a $3 million loss on sales of under $47,000.

Topo is a three foot high plastic robot that looks like a snowman on wheels. It's controlled by an Apple II with programs written in either Basic or Logo to move it around the room. A talking version was promised but has yet to be delivered.

Androbot is promising seven new products this year which will include versions of Topo with sensors, voice, and the ability to be controlled by other computers such as the IBM PC and Atari. A BOB (Brains On Board) unit is also promised.

★★★★★★★★

Osborne news

Osborne Computer is still operating under Chapter 11 bankruptcy protection and looking for a possible purchaser of the company, to provide the funds for it to continue in operation and introduce its IBM PC compatible version of the Executive, plus a new portable computer. Working prototypes of both units are reported to exist. Osborne is reported to have a substantial quantity of Osborne I and Executive models in inventory in both assembled and parts forms.

If the company is forced to liquidate, Robert Jaunich, president of Osborne Computer, has stated that unsecured creditors will, at best, get 10 to 15 cents for each dollar owed. In the meantime, lawsuits have been filed against Adam Osborne, founder and Robert Jaunich, president, charging misrepresentation of financial status when selling securities.

★★★★★★★★

IBM drops Josephson device project

IBM has halted all development work on Josephson technology and closed its pilot production plant. IBM had hoped to use Josephson devices in its next generation of high performance mainframe computers. These superconducting devices promised operating speeds 50 times faster than current systems.

The 20-year-old project has cost IBM an estimated $100 million and had got to the point where IBM had built prototype cache and RAM memory systems using the devices. The decision to cut back was reportedly based on the rapid advances in conventional silicon technology and the problems related to producing reliable Josephson devices.

★★★★★★★★

War of the windows

Visicorp demoed its Visi On window-type front end software package for the IBM PC in November 1982 at the Comdex show in Las Vegas, promising delivery in June 1983. The package is designed to make personal computers more 'user-friendly' and employs a mouse, rather than a keyboard, for system control. These packages allow users to work with more than one application software package at the same time. To some degree it provides the features of the Apple Lisa and Xerox Star.

However, the task of moving from a demo package to actual saleable software proved a more formidable undertaking than originally envisioned. The result was that initial shipments to dealers did not begin until November '83, a year later. Visicorp reckons it took three years to develop the package with an investment of $12 million.

In the interim, Quarterdeck Software introduced its DesQ windowing package for the IBM PC. Microsoft is expected to ship a new version of MS-DOS with window capability, by this summer, if not sooner. And Digital Research has disclosed that it's also working on windows for its CP/M-86 operating system

C·O·M·M·U·N·I·C·A·T·I·O·N·S



PCW welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Please note that we are unable to give advice about the purchase of computers or other hardware/software — these questions must be addressed to Peter Bright (see 'Computer Answers' page). Address letters to 'Communications,' Personal Computer World, 62 Oxford Street, London W1A 2HG.

Personal opinion

I am not writing to criticise your magazine in particular, as I feel the points made below are equally applicable to the rest of the magazines on sale at the moment. They are all personal opinions: I am in no way connected with any of the manufacturers of the machines mentioned, and I do not have a computer of my own.

Would it be too much to ask why magazines constantly praise the BBC Micro?

At Lord Wandsworth College we have three BBC Micros available for general use, and one RML 380Z. In the first six weeks of term we had five faults on the BBC systems, while the RML has let us down once, and then only a minor fault in the five years we have had it. The BBC's software can be crashed easily and the systems behave inconsistently, to say the least. The 380Z, while it can still be crashed (though not as easily), has none of the major defects of the BBC and is, in my opinion, a better and more 'usable' machine for schools.

Why do magazines test and compare systems on a common basis, when so many are intended for different tasks, or when the overall judgement is a matter of opinion? One good example of this is the Lynx, about which magazines have expressed 'stern reservations'. This machine is far superior to the BBC. Am I the only person who thinks like this? Do I need my head examined, or is there perhaps some connection between various magazines and some computer companies?

Perhaps we could have some reviews that take into account more than one point of view, before too many people are misled by one-sided summaries of systems.

N Whitfield, Long Sutton, nr Basingstoke, Hants.

(We're not especially pro the BBC, though of course it does have many users. We try to provide something for everyone in PCW. *I'll welcome the day when a wider range of machines is taken on board by schools — Ed)*

Sexist

I refer to Jon Vogler's article on computerising your business which appeared in the November issue of *PCW*.

He mentions the small businessman or woman and notes that he will refer to them both as 'he' simply for convenience. I am assuming that many of your contributors who also refer to 'he' and make no mention of women at all are simply using the so-called 'generic he' as well. It is somewhat surprising, given this use of generic terms, that no-one has yet decided to use the generic 'she' instead.

Admittedly many computer users are men, but even today it is not *solely* their domain. Furthermore, if it is desirable to encourage members of both sexes to utilise these technological marvels, as would seem to be the case, perhaps a positive effort to associate women with computers as users would be more effective than photographing them (computers) with Miss World?

Sheldon R Reback, Edgware, Middx.

(We could try it, but I think I prefer the non-sexist 'user' — Ed (she))

DIY

One hears so often these days of poor service and dilatory and unhelpful correspondence, that it might make a refreshing change to report a bouquet rather than a brickbat.

Some 18 months ago I bought a Smith-Corona cheap, daisywheel printer, with which I was delighted until it recently developed a fault — it kept stopping in mid-sentence.

I wrote to the suppliers, Discom of Evesham, explaining my problem and asked whether this might be a 'known fault' that I could cure myself, maybe with some spare part, or whether I would have to send the machine halfway across the country for repair.

To my astonishment (and I mean that), I received a lengthy letter by return of post suggesting no fewer than six things which I could do myself, but saying that only failing all of these would I have to return the unit to them for repair.

So often it takes two to three weeks before one gets an unhelpful, brief reply saying 'send the thing to us'. It is unusually pleasant to deal with a supplier who tries to be so helpful, so promptly: a public bouquet seems to be appropriate.

Jeffery English, FCA, Brockenhurst, Hants.

(But did the suggestions work!? — Ed)

Inefficient

Hasn't Gauden Galea heard of the system variable BORDCR to change the attributes in the lower part of the Spectrum screen? Also, has he or she not heard of the instruction "PRINT #0" which prints in the lower part of the Spectrum screen?

Using these two facts, the program in your December issue 'Spectrum Screen Extension' could have been written in two or three lines — rather more efficiently than the published version.

Ian Davies, Edgbaston, Birmingham

(Whoops! — Surya)

DAI lives on

Thanks for mentioning the DAI personal computer on page 238 of your December issue. However, you say it's no longer available. It is!

Anyone interested should contact Data Applications, 16b Dyer St, Cirencester, or myself.

D Atherton, 16 Douglas St, Atherton, Manchester

Illustration by Kevin Grey

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CHIP CHAT

A former IBM (UK) employee has apparently become a Sirius dealer. Certainly a battle royal is under way between the two companies. The experience of Jeremy Ensor, a London dealer who stocks both the IBM PC and the ACT Sirius, is that the former is outselling the latter by ten to one. John Leftwich at ACT says the country-wide figures tell a different story: his industry sources have the Sirius outselling the PC by three to two. John points to a new weapon now in action in the microcomputer sales combat zone — corporate image enhancement.

With the number of manufacturers going down the tubes threatening to block the plumbing, it begins to make sense to stress company stability. John mentioned Olivetti as one company using these tactics at the moment.

A more sinister (and desperate) approach is the one some dealers of both PCs and Apricots are reported to have received recently in an invitation to lunch with IBM officials — we hear the after dinner conversation centred on 'how to combat the Apricot'.

Jeremy Ensor finds the whole idea ludicrous. As a dealer in both machines he is a prime candidate for such an invitation, but no-one has invited him to this hypothetical hoe-down. 'It doesn't sound like anything IBM would either do or need to do. The two machines are in different markets: we sell IBMs to large companies, whereas Apricot buyers are in a lower price bracket. We haven't found a conflict between the two.' Once again ACT agrees to differ. John Leftwich reckons IBM has now selected ACT as its major competitor in the UK PC market. Spectators may be in for a fine firework show as the fighting escalates . . .

Talking of wars, Mel Croucher of Automata UK has strong views on the subject of killing, bombing, shooting and conquering games. None of the games produced by his company encourages youngsters to use 'the greatest innovation of our age which is to teach kids that killing is OK'.

Cynics will sneer and point to the fact that the company's retail outlet does stock other people's games nasties, but Mel points out that Automata is a democratic business, and the shop is at liberty to exercise free will! He is personally committed to keeping murderous simulation out of Automata's own software catalogue . . .

Atari on the other hand, not content with turning young persons' living rooms into battle zones, is going to teach the US army how to fight. TRADOC, the US Army Training and Doctrine Command recently completed a study of arcade games technology. As a result, Atari has won a contract to modify its bestselling 'Battle Zone' game and create a scenario in which the controls and weapons of the M2 infantry vehicle are simulated. Mel Croucher, speaking for himself and *not* for Automata, said this was about par for the course, since it suggested that the mentality of people who made war was on the same level as that of the kids who buy violent arcade games . . .

Now it can be told! Technology Minister Kenneth Baker was so excited about a personal gift of BBC computers (instead of a more traditional silver casket) to the Indian president by HM the Queen that he announced it two days before Queen Elizabeth handed over the goods.

Following Baker's disclosure of the gift at 9.30am on the Monday of the Commonwealth Communications Conference, a wall of silence was thrown up in record time both around the Palace and around Acorn. The silence persisted until HM handed over the loot two days later. The Acorn announcement, when it finally came, coincided with a story in the *Financial Times* that 200 Acorn BBC computers had been ordered by an Indian state-owned electronics corporation . . .

The Bible is providing more quotes for some computerised clergymen who use a free 'sermon generator' program provided by a firm called — wait for it — Kingdom Software.

It turns the testaments into a huge database which can be interrogated for any hit-word required. More than 30 UK clergymen are now equipped with this program, so listen out for a significant increase of learned references from your Vicar next Sunday . . .

If you want a new computer but can't afford one, try buying a second-hand car from Ford dealer Bygraves of Biggleswade. For only £4395 you can have a Cortina 200 GL automatic (X registration model) and become the proud owner of a free Acorn Electron. Underseal and alloy keycaps are extra . . .

Just when you thought it was safe to go back to the terminal . . . Verbatim, purveyors of quality disks to the gentry has been looking at the problems of hard done by wordprocessor operators. 68 per cent of the operators interviewed complained of eye and back strain which they put down to poor lighting and bad posture. Ever eager to help, Verbatim has hired Ms Denise Austin, who specialises in 'employee fitness, stress management and aerobics' (oh no, not again) to come up with an answer. Ms Austin's solution is a series of exercises called 'tone up at the terminal': now you can type and keep fit at the same time. You are more likely to strain yourself doing the exercises than just sitting and typing, so I think I'll give this one a miss . . .

END

BLUDNERS



Frank Dutton's article 'Plane Thinking' (December *PCW*, page 196) contained an author's error.

For a perspective drawing the correct viewing transformation matrix has the form:

1	0	0	0
0	1	0	0
0	0	0	$-1/z_v$
$-x_v$	$-y_v$	0	1

When this is used to transform the vertices of the face polygon [x y z] the product is [$x - x_v$ $y - y_v$ 0 $1(-z/z_v)$]

To find the screen coordinates [Xs Ys 0 1] the last element must be reduced to unity.

So $Xs = \dfrac{x - x_v}{1(-z/z_v)}$

and

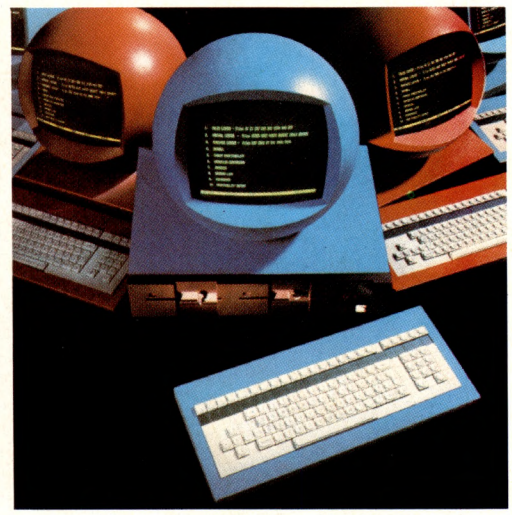
$Ys = \dfrac{y - y_v}{1(-z/z_v)}$

The missing part of the 'Omniopoly' program (January '84) will be printed next month.

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